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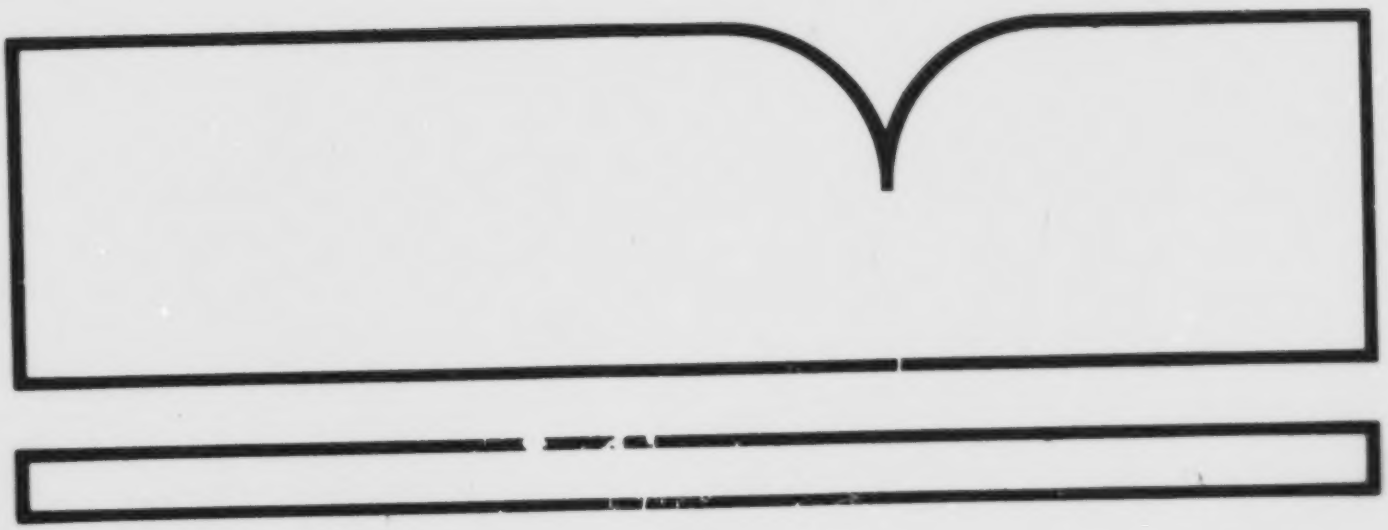
Institutional Constraints and Public Acceptance Barriers to Utilization of Municipal Wastewater and Sludge for Land Reclamation and Biomass Production

Urban Systems Research and Engineering, Inc.
Cambridge, MA

Prepared for

Environmental Protection Agency
Washington, DC

Jul 81



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BIBLIOGRAPHIC INFORMATION

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This study has involved an analysis of the institutional constraints and public acceptance barriers to the development of full scale projects utilizing sewage sludge in land reclamation and biomass production. Public opposition to land application projects is generally initiated by a small group with a very strong anti-project bias. Public officials, in local government or regulatory agencies, may also be opposed to a proposed project and can frequently use their authority to impede development. Compliance with the various institutional and regulatory requirements is a project's first line of defense.

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INSTITUTIONAL CONSTRAINTS AND PUBLIC ACCEPTANCE BARRIERS TO UTILIZATION OF MUNICIPAL WASTEWATER AND SLUDGE FOR LAND RECLAMATION AND BIOMASS PRODUCTION

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December 1980

A Report to:

The President's Council on Environmental Quality
David Burmaster
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EXECUTIVE SUMMARY

While researchers have repeatedly demonstrated the technical feasibility of utilizing POTW's sludges for the reclamation of disturbed lands, there have been relatively few full scale projects implemented. Public opposition and institutional red tape have often caused delays and have resulted in some projects being abandoned. This study has involved an analysis of the institutional contraints and public acceptance barriers to the development of full scale projects utilizing sewage sludge in land reclamation and biomass production. The findings of this research are often applicable to a broader range of wastewater and sewage sludge land application projects.

Public opposition to land application projects is generally initiated by a small group with a very strong anti-project bias. This group may include abutters to either the application or intermediary storage sites, residents along transportation routes, and concerned citizens. Once a core group is formed, it attempts to halt or modify the project utilizing political, regulatory or judicial channels. Public officials, in local government or regulatory agencies, may also be opposed to a proposed project and can frequently use their authority to impede development.

Compliance with the various institutional and regulatory requirements is a project's first line of defense. Depending on the quantity and quality of the sludge applied, certain future uses of the site may be restricted for compliance with EPA criteria for acceptable solid waste disposal facilities and requirements governing land application of sewage sludge under RCRA and CWA.

However, the states, which are responsible for implementing solid waste and sludge management control programs, may promulgate even more stringent requirements. Local governments frequently have their own requirements in the areas of public health and land use control. Thus there are a multitude of regulatory requirements providing opponents with many opportunities to delay a project.

When the site to which the sludge is to be applied is a strip mine, the situation is further complicated by the requirements and procedures which have been, and are being, developed under the SMCRA.

Citizens groups also may seek an injunction against a project based on general nuisance claims (particularly for odor).

Given this complex institutional structure and the likelihood that a core opposition group will form, it is useful to learn what measures have proven effective in expediting projects. The study reports on the use of demonstration projects, site visits, public relations campaigns, and compensation schemes.

SECTION 1

INTRODUCTION

Researchers have repeatedly demonstrated the technical feasibility and potential benefits of applying municipal sewage sludges to enhance biomass production and reclaim disturbed sites. The formidable tasks of obtaining regulatory approvals and overcoming public concern often discourage serious examination of the alternative. However, those who have successfully negotiated the approvals process have achieved excellent results, both in terms of land reclamation and biomass production. These successful projects are proof that overcoming institutional constraints and public acceptance barriers can be well worth the effort.

The goals of this research effort have been to identify the institutional pitfalls and public opposition obstacles, and to suggest methods for addressing these non-technical aspects of project implementation. The study focused on projects utilizing sewage sludge for reclamation and biomass production, although many of the findings presented here are relevant to a broad range of municipal wastewater and sewage sludge land application projects.

Section 2, Constraints and Barriers of Project Implementation, sets forth theoretical analysis of the public and institutional framework within which projects must be proposed and implemented. The current legal, regulatory and institutional structure on the federal, state, and local level is reviewed. The possible strategies of public interest groups which might oppose a proposed project are also presented.

To assess the magnitude of institutional constraints and public acceptance barriers to project implementation, a series of case histories was developed. Information on the non-technical aspects of successful, as well as unsuccessful attempts to establish projects has been collected from secondary sources and extensive telephone interviews with project participants. An analysis to the case study data is presented in Section 3, Past Experience. The analysis attempts to discern patterns that may assist sponsors of future projects in developing their proposals and strategies for obtaining necessary approvals. Reports of the individual cases are presented in Appendix A of this report.

Strategies which a potential sponsor might use to mitigate the impacts of institutional constraints and public acceptance barriers are presented in Section 4, Strategies for Sponsors. The conclusions drawn from both the theoretical and case study analyses are set forth in the form of recommendations to those wishing to initiate considerations of a sewage sludge reclamationor biomass production project. For the most part, these strategies would be equally applicable to any type of municipal wastewater or sewage sludge land application proposal.

SECTION 2

CONSTRAINTS AND BARRIERS

Public Opposition

Although some land application projects have proceeded virtually unopposed, most have generated some level of local controversy. If a sufficient number of individuals feel their interests threatened, the "Core Opposition Group" they form can often mount a significant campaign against a project. Historically, Core Groups have been formed to oppose a specific project. In contrast, traditional environmental organizations, such as the National Wildlife Federation, National Resources Defense Council, Sierra Club and Audubon Society have typically not mobilized their membership against such projects.

While Core Groups may vary in composition from site to site, they most frequently include owners of property abutting the project site or along the transportation route to be used for site access. Such parties generally expect that a project will result in personal inconvenience or loss of property value. Other private citizens may also participate in Core Groups, however, for a variety of reasons including environmental and health concerns, and general animosity toward accepting another municipality's sludge. Once a Core Group has coalesced, a strategy for fighting the sludge project may be developed, consisting of one or more of the following components:

- Regulatory Intervention: Before a project can obtain the necessary federal, state or local approvals, opponents may seek to intervene in the regulatory proceedings. Simultaneously, they may launch a political effort to influence regulatory decision makers, either through direct lobbying or by indirect means such as public information campaigns. The goal of the component is either to deny a project sponsor the necessary permits outright, or to raise the costs of obtaining such permits sufficiently to make the project financially infeasible. Since land application projects are likely to be anything but routine, the Core Group may attempt to convince a large number of licensing and permitting authorities to assert their jurisdiction. Frequently, such efforts can be successful if the roles of the various federal, state and local authorities are not well defined. Of course, as experience with land application increases, the regulatory scheme will become more routine and the possibility of overlapping and conflicting jurisdictions should decrease.

- Court or Administrative Challenge: Once a particular approval has been given, opponents may challenge this decision in an appeal either to a higher administrative authority (if there is one) or to the courts. Courts often decline to consider an appeal, however, before administrative remedies have been exhausted.

  The ground for such an appeal may be jurisdictional, procedural or substantive. A jurisdictional challenge questions the power of the particular agency or board to grant the approval given. A procedural challenge is aimed at the process by which that approval was given and may involve allegations of violations of due process or of any applicable administrative procedures. A substantive challenge questions the sufficiency of the evidence in support of an approval decision, or the correctness of the standard applied. Any of these proceedings can, of course, be quite lengthy and can raise the cost of gaining final approval. However, litigation and appeals are costly to the complaining parties as well.

- Nuisance Action: Even after approval of a project is final, opponents can challenge the project in a common law nuisance action. Such an action may be difficult to maintain if the characteristics of the project that are alleged to constitute the nuisance--for example, its odor--have been expressly sanctioned in the regulatory proceeding. In most cases, however, nuisance allegations arise when the actual characteristics of a project fall below the standard promised during the regulatory proceeding. While it is occasionally possible to have a project declared to be an "anticipatory nuisance," based on a finding that the untoward effects alleged are imminent and unavoidable, generally nuisance actions must await the initiation of a project. Nevertheless, the availability of a nuisance action permits project opponents to resume their dispute long after they lose the regulatory battle.

Institutional Setting

Obviously, no project will proceed unless some public or private organization is willing to serve as its sponsor. The sludge generating municipality, the consulting engineers, the site owner, or the receiving

community may initiate consideration of a land application project. In many cases the primary sponsors have retained the services of a specialized contractor to actually implement the program. This is a reflection of the relatively low levels of capital investment and high personal service requirements of project sponsorship. In contrast to other wastewater and sludge treatment technologies, land application primarily involves identifying sites, attending public hearings, meeting with public officials, negotiating with landowners and transportation companies, and applying for the necessary permits. All of these activities are generally aimed at only a few weeks of actual sludge application annually. While a firm that specializes in performing the necessary services can apparently profit from the initiation of a reclamation project, the more traditional consulting engineering firm, which concentrates on equipment design, has few incentives to participate.

A key actor in a sludge reclamation project is the application site owner. The range of possible public or private site owners presented in Figure 1 is reflected in the variety of institutional arrangements exhibited in the case studies. The type of ownership becomes a key factor in cases where, in order to meet permit requirements, certain restrictions must be placed on the future uses of the sites. Such restrictions are not uncommon on publicly-owned lands. However, a private owner may demand compensation in some form before accepting a restriction on the use of his land, and enforcement of such restrictions may be impossible.

The siting of a land application project has the potential for creating controversy. Moreover, this potential increases with any increase in the number of regulatory bodies which may have jurisdiction over the site. Since each review conducted, or permit applied for, represents a possible snag in the approval process, it also represents an increased potential that the proposed project may not be initiated.

The U.S. Environmental Protection Agency (EPA) has promulgated guidelines for land application of municipal sewage sludge and the Office of Surface Mining of the Department of Interior has developed guidelines for mine reclamation practices. These federal guidelines represent minimum levels for acceptable performance. The states have been tasked with developing programs to implement these guidelines. EPA's regional offices are assigned the duty of insuring state compliance with EPA guidelines. In addition, some state and local governments have developed more stringent regulations. However, since each requirement is set to serve the issuing organization's best interests, the rules vary considerably. It is difficult to reconcile all of the regulatory requirements applicable to a given application site. This problem can be exacerbated when the staffs of the various regulatory bodies exhibit competitiveness or jealousy over their jurisdictional authority.

Many of the regulatory agencies that have jurisdiction over some aspect of a municipal sludge land application project are listed in Figure 2.

FIGURE 1

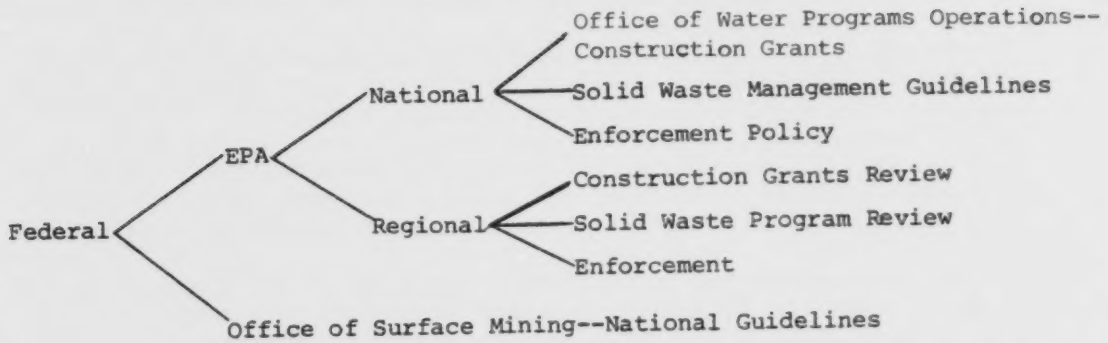
LAND OWNERSHIP

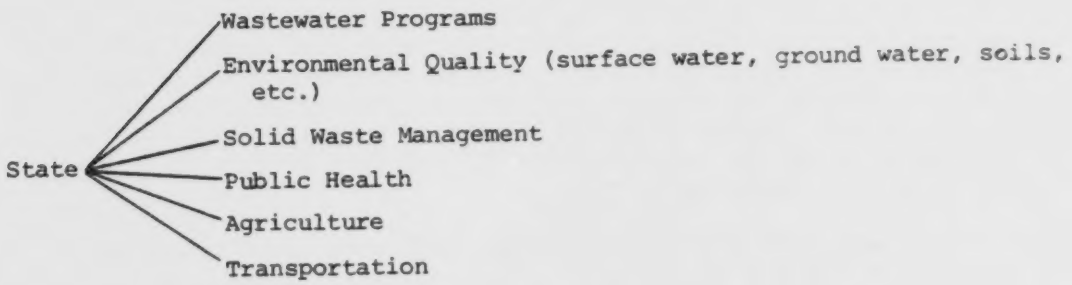
PUBLIC	PRIVATE
• Federal Government (National Forest, National Park, DoE, Department of Interior, Indian Lands, etc.)	• Private Owner in Fee Sample (industry, coal company, timber company, farmer, private individuals, environmentalist organizations, etc.)
• Federal Lands managed by private concerns (mineral or timber rights leased to private concerns)	• Private Owner in Fee Subject to mineral or timber rights in another party
• State (parks, conservation land, forests, abandoned coal mines, etc.)	• Owned by Private General Contractor
• Local (wastewater management authority, land within one community but owned by another, conservation and recreation sites, etc.)	

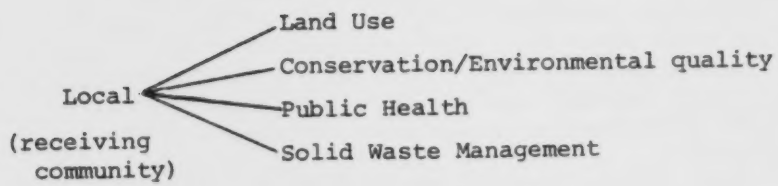
FIGURE 2

INSTITUTIONAL FRAMEWORK

Agencies with Jurisdiction over Land Application







LEGAL AND REGULATORY

Federal Programs

Wastewater Management: Under the Federal Water Pollution Control Act (FWPCA)[1] as amended, nearly all POTW's were required to have achieved secondary treatment by 1977. They are also under a mandate to use the "best practicable" waste treatment technology by 1983.

To assist municipalities in meeting their obligations under the FWPCA Act, EPA is authorized to pay 75% of the costs to plan, design, and construct municipal wastewater treatment facilities. Over 20,000 grants for planning, design and construction, amounting to about $28 billion, had been made under the program by September 1980. Thus, as a practical matter, EPA has a considerable influence over POTW technology through both its regulatory and its construction grants programs.

The 1977 amendments to the FWPCA, contained in the Clean Water Act (CWA), placed new "technology forcing" mechanisms into EPA's hands by providing incentives for the use of "innovative and alternative" (I/A) technology in the construction grants program.[2] EPA had defined land application of POTW sludges as an alternative wastewater treatment and sludge technology within the definition of this provision. An I/A process option can be funded if the life cycle cost exceeds the life cycle costs of the conventional option by less than 15%. In addition, EPA may fund 85%, rather than 75%, of eligible cost for the I/A portion of any project. Finally, EPA is authorized to pay 100% of all costs to replace or modify I/A facilities if they fail to meet their performance specifications.

In a series of regulatory measures beginning in 1975, and as yet incomplete, EPA has restricted the incineration,[3] ocean dumping,[4] land disposal,[5] and landspreading[6] of sludges. Each of these measures has effectively made the disposal of sludge more complex and more costly, and in part has contributed to a shifting of the focus away from disposal methods that are regulated to methods that remain unregulated, or are regulated less severely. EPA has promulgated a set of interim final* regulations for land disposal of POTW sludges under the joint authority of the CWA[7] and the Resource Conservation and Recovery Act (RCRA)[8]. Two provisions are most relevant to POTW sludge reclamation projects:

1) No contamination of underground drinking water sources beyond the outermost perimeter of the site is permitted;

2) The cadmium and polychlorinated biphenyl (PCBs) levels of POTW sludges applied to land used for the production of food chain crops**are strictly regulated.

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*Final regulations are expected in December 1980. Major changes in the structure of the regulations are not anticipated although numerical values may change.

**The term food chain in this context refers to human food chain.

Of the metals present in municipal sludge, cadmium is of greatest importance because of its potential toxicity and the relatively low levels in the natural background. EPA has expended much effort to develop health protection criteria for this metal pollutant.

With respect to cadmium, a less stringent standard is set for those lands where the only food-chain crop produced is animal feed; a plan exists for assuring that the crops produced will not be ingested by humans; and future owners are notified by a stipulation in the land record or property deed that the site has received high cadmium waste applications and that food chain crops should not be grown due to possible health concerns.

In situations where sludge is used as an amendment for growth of agricultural crops, annual and cumulative limits for cadmium have been recommended. These limits are designed to minimize the potential for plants to incorporate this metal into plant tissue which may later be consumed by animals or humans. The imposed limits take into account three factors:

1) The type of crop is important since metals such as cadmium more readily enter the leafy portions of crops than the grain or root portions. Thus, the selection of a crop permits a degree of control over cadmium uptake.

2) The annual and cumulative loadings of metals provide a quantitative framework for assessing the soil's capacity to bind metals. The cation exchange capacity (CEC) of the soil is a measure of the degree to which metals are bound to soil particles and consequently the degree to which the metals can be leached into solution where they would be available to plants. Thus, annual and cumulative loadings of metals need to be evaluated so that the metals holding capacity of a given soil is not exceeded. Metal loadings to soil must be known to keep metal levels in the soil below concentrations that are toxic to plants.

3) The pH of the soil strongly governs the uptake of metals by plants. Since most of the metals of concern are present in soil as insoluble precipitates under neutral-to-basic conditions, their availability to plants is lessened. Alternatively, acid soils (pH less than 6.0) facilitate metal movement into plants and groundwater.

EPA's cumulative limits (interium final) for food chain application range between 4.5 and 18 lbs./acre cadmium (depending on the soil CEC) per acre application.

With regard to PCB's, EPA's concern has been directed toward methods of incorporation into soil, depending on the PCB content of sludge. This criteria is based on the observation that municipal sludge may be ingested by grazing cows if it is deposited or merely sprayed on soil or growing crops. One potential result of such ingestion is the appearance of PCB's in milk. To minimize this possibility, EPA requires that sludges containing 10 ppm (interim final) or more PCB be incorporated into soil. Other regulations on PCB's and their implications for sludge management practices are being developed by EPA.

The interim final regulations outline two levels of treatment for pathogen control and stabilization of POTW sludge prior to land application. The less stringent treatment is authorized where public access to the land is controlled for at least 12 months after application, and grazing by animals whose products are consumed by humans is prevented for at least one month. The more stringent treatment is mandated if crops for direct human consumption are grown within 18 months of the application and there will be contact between the sludge and the edible portion of the crop.

EPA is now developing proposed regulations to govern the distribution and marketing of sewage sludge products.[9] These regulations would be in addition to the landspreading standards described above in order to fill important regulatory gaps until comprehensive sewage sludge regulations can be formulated and put into place. It is expected that these regulations would add a substantial recordkeeping requirement to the present provisions governing land application.

Other EPA Land Disposal Programs. RCRA also contains additional provisions that may apply to the land application of POTW sludges. In particular, under Subtitle C of RCRA, EPA has issued "cradle to grave" regulations governing the disposal of hazardous wastes. While most POTW sludges will not constitute hazardous wastes, there is nothing in the regulatory definition of the term that would automatically exclude them. That definition is based upon four characteristics: ignitability, corrosivity, reactivity, and extraction procedure (EP) toxicity.

Sludge is obviously difficult to ignite, and seldom corrosive or reactive; the real concern is EP toxicity. A POTW sludge is presumed to be nonhazardous unless EP tests, conducted either by the POTW staff or another organization, indicate otherwise. The potentially hazardous chemicals of concern are those listed in EPA's drinking water quality criteria and include:

Arsenic	Endrin
Barium	Lindane
Cadmium	Methoxychlor
Lead	2, 4, D
Mercury	2, 4, 5T
Selenium	
Silver	

If the EP testing results on a specific sludge show that the concentration of one or more of the above chemicals equal or exceeds 100 times the drinking water standards (for the respective chemical), the sludge is considered to be a hazardous waste and subject to the provisions of the hazardous waste regulations. Based on recent information, very few sludges are likely to be designated hazardous under EPA's EP testing procedure. However, new criteria, such as one for PCB's, are expected to add to EPA's list in the near future. This may increase the fraction of those sludges found to be hazardous wastes.

If a particular sewage sludge is found to be a hazardous waste, then the site of a land reclamation project utilizing such a sludge would be a hazardous waste disposal facility. EPA has promulgated extensive regulations governing the operation, maintenance, monitoring and eventual closure of such facilities, including numerous safeguards designed to protect surface and groundwater quality from contamination, and to restrict uses of the site in perpetuity.

In the preamble to the hazardous waste regulations, EPA has acknowledged that it eventually intends to issue a comprehensive regulation under the authority of §405 of CWA, dealing with all forms of sewage sludge disposal. Such a regulation, EPA states, will deal with both hazardous and non-hazardous sewage sludges and will include provisions "equivalent" (but not necessarily identical) to those contained in the existing RCRA hazardous waste regulations. Once such regulations are in place, EPA states that it intends to exclude sewage sludges from the provisions now in effect. For now, however, these provisions govern land disposal of sewage sludges that are found to be hazardous wastes.

No regulations presently cover the large number of potentially toxic synthetic organic chemicals (other than PCB's) in sewage sludge. This situation exists because a vast majority of these chemicals are present in only trace quantities and generally constitute no health hazard. Note that such organic contaminants present in sewage sludge would probably not be highly toxic to soil microorganisms since they would have been toxic in the sewage treatment plant organisms, and would already be known.

Surface Mining Control and Reclamation Act. The Surface Mining Control and Reclamation Act,[10] passed in 1977, established a nationwide program to protect the environment from the adverse impacts of surface coal mining and prohibits such mining where land reclamation is not feasible.

The Department of the Interior issued its regulations under SMCRA in March 1979. They set performance standards for surface mining of coal to protect the environment and the public health and safety. Specifically, the regulations require mine operations post a bond to insure that they will conserve natural resources in the course of their mining activity; stabilize surface areas during mining and reclaim mine lands contemporaneously as mining proceeds; and restore prime farmland and revegetate all land promptly upon completion of the

mining operation. The regulations require that the soil be able to support the same or higher uses after reclamation that it was capable of supporting before the mining operation began.

Where the land was used for agricultural purposes before mining began, the SMCRA regulations require that such agricultural uses be possible after reclamation. Yet, under the regulations governing sludge application, such future uses may need to be prohibited or restricted for some time, or even permanently, depending upon the quality and quantity of sludge and sludge contaminants applied to the land. Where such a prohibition or restriction would be permanent (based on current and future guidelines) the SMCRA requirements may not be met. Where such a restriction would be temporary, for example 18 months, the SMCRA regulations would appear not to be met during the time of the restriction. Holding of the bonds posted by a mine operator to guarantee reclamation may be required during that period. However, if the land was a forest and not involved in food chain crop production before surface mining operation began, the SMCRA regulations requiring that it be suitable for reforestation after reclamation could easily be met even if restrictions were placed on the land for future food chain crop production by the sludge management regulations.

SMCRA establishes an Abandoned Mined Reclamation Fund, financed by fees levied against all coal mine operators subject to the Act, to be used for reclaiming and restoring land adversely affected by past coal mining, including revegetation of such land. The Fund is to be used to reclaim land that was mined or affected by mining before August 3, 1977; that was left in unreclaimed or inadequately reclaimed condition; and for which the mining operator has no continuing responsibility for reclamation. The Fund may be used to acquire land by purchase or eminent domain, if such acquisition is deemed necessary for successful reclamation.

There is no regulatory obligation for abandoned mine lands that are being reclaimed to be restored to their use before mining began. Thus, the fact that sewage sludge application might restrict future land use should not pose a barrier to projects on abandoned mine lands. Of course, if the land is to remain in private hands, the owner would have to agree to any restrictions on her own and later uses the land, preferably by deed restriction.

The National Environmental Policy Act. The National Environmental Policy Act (NEPA)[11] requires that an environmental impact statement be prepared for all "major Federal actions significantly affecting the quality of the human environment". The award of a construction grant for a large POTW by EPA can be such a major federal action warranting a full EIS. It is common for EPA to conduct only an environmental assessment before awarding small grants. Where the grant involves funds to implement land application projects, the impacts will be examined by EPA in either the EIA or EIS process before a final funding decision is made. A problem arises on how to prepare an EIS if the actual application sites are not yet known. In addition, alternative means of sludge management must be considered and their environmental consequences evaluated and compared to the land application

option. An EIS frequently takes months or even years to complete, but the federal action at issue cannot proceed until this process is complete.

Actions taken by the Interior Department under SMCRA might also be considered "major" and thus require an EIS. A decision to license a major mining operation is one example. A decision to reclaim a major abandoned mine is another. In both these instances, an EIS might have to be prepared before the final decision is made.

State Programs: Relevant State Agencies

Wherever a public agency or private body decides to investigate, sponsor, or promote a land application project utilizing sewage sludges, it will face the problem of compliance with the various federal regulatory programs and funding conditions outlined above. In contrast, experience with state and local regulations may vary widely. This is because the 50 states are separate sovereigns, each with their own administrative structure and regulatory priorities. Thus, there is no uniform body of state procedures or substantive regulations that will apply to a project involving land application. Nevertheless, a few common aspects of several state programs can be highlighted.

As noted above, a number of regulatory bodies may have authority over a sewage sludge land application project. In many states, most of the environmental regulatory power is vested in a single agency, such as a Department of Environmental Affairs. Such an agency may be separately constituted, or it may be part of a state Public Health Agency, which has a wider jurisdiction. Many states also have Departments of Natural Resources that have primary authority over minerals, watersheds, certain lands such as forests, and other natural resources. Finally, many states have Departments of Agriculture that may be concerned with the proper protection of farm products.

In nearly every state, at least one form of license or permit would be required to apply POTW sludge to a particular site. Thus, for example in Pennsylvania, the Department of Environmental Resources must issue a permit for sludge utilization in land reclamation projects. The state has issued guidelines which specify maximum lifetime loading rates for land reclamation under conditions where farming of the reclaimed site is not intended. A maximum of 3 lbs. of cadmium per acre is specified along with a maximum sludge loading of 60 dry tons per acre. The implications of this limitation are potentially significant when one considers that sludge loadings for reclamation projects are also based on the nitrogen content of the sludge. For example, good management practices utilize about 1000 lbs. total nitrogen per acre. (It is generally assumed that only 200 lbs. of nitrogen is actually available for plant uptake during the first year.) Thus, if the nitrogen content of the sludge is 1% then 50 dry/acre is necessary. If, however, the sludge has been composted and has a nitrogen content of 0.5% then 100 dry tons/acre are needed to provide sufficient nitrogen. This loading would be in excess of the 60 dry ton limit and would not be possible irrespective of cadmium content under the current Pennsylvania guidelines as is shown in Figure 3.

FIGURE 3

RELATIONSHIP OF CADMIUM CONTENT OF SLUDGE
TO SLUDGE LOADINGS TO SOIL

Cd Content in Sludge (ppm)	Sludge Lifetime Loadings Under Penn. Guideline (tons/acre)
10	150*
20	75*
25	60
40	37.5
80	18.7

*Not allowed because of 60 tons/acre limit on total sludge.

When the values of Figure 3 are compared, for example, with loading rates of one hundred tons/acre (for a 0.5% nitrogen content sludge) needed to restore both the organic matter and nutrients to strip mined lands, a potential constraint is apparent if the cadmium content of the sludge is 20-30 ppm. The conservative nature of these guidelines apparently arose out of the perception on the part of officials that there would be a lack of on-site controls during and following sludge application. It is important to note, however, that if a sludge is low in nitrogen content, commercial fertilizers containing nitrogen can be added to augment the nitrogen content and consequently reduce the need for higher overall sludge loadings.

Permits issued for land application of sludge typically are accompanied by a number of special conditions designed to assure project safety. These requirements are likely to become more structured as states gain experience with RCRA and other applicable environmental regulatory programs, and as comprehensive sludge disposal regulations, under CWA, are developed by EPA. At present, the permit conditions may be the product of case-by-case ad hoc agency deliberations, under a general mandate to protect the environment, public health and safety. Typically, such conditions might include requirements that the operator of the site provide for proper surface drainage and initiate a monitoring program. States may require that private contractors post a bond or otherwise demonstrate financial responsibility for damages that may be caused by a land application project.

In addition to direct permitting of land application sites, a number of state agencies may assert authority over and the right to control such operations because of their concern with a particular aspect of public welfare potentially affected by the operation. For example, most states have drinking water programs that require monitoring and protection of water supplies from certain contaminants. Similarly, air pollution control boards may conceivably be concerned with the potential for odors or aerosols being generated during land application. In states with substantial mining operations, a state or local agency may be specifically authorized to regulate the operation of land reclamation projects on mine sites.

Local Programs

Powers of Organizations Operating the POTW. States have comprehensive police powers, may take a variety of regulatory actions and may make spending decisions they deem appropriate when in reasonable pursuit of protecting the public's health, safety and welfare. Local governments frequently lack such powers. Local government entities, whether a municipality or a special purpose authority, typically have only limited powers, and must adhere closely to the restrictions of their state enabling legislation.

A number of powers which would be quite useful to the successful implementation of a land application project may thus be lacking in particular situations. These powers would be especially important where the operator of the POTW generating the sludge is the project sponsor. They might include the power to engage in commercial activities beyond the operation of the POTW; the power to acquire land by purchase or eminent domain within or outside the physical jurisdiction of the POTW authority; the power to operate sewage facilities outside such boundaries; and the power to give something (sludge) away. Depending on the design of a particular project, any or all of these powers may be required. If the POTW authority does not have the necessary powers, new legislation may be required to grant them, or the project may have to be restructured or limited in scope.

Relevant Agencies in the Receiving Community. A number of local boards and commissions may assert authority over the site where POTW sludges are to be applied. In a few communities, a local board such as a county health department has primary authority over the siting of waste disposal facilities. It may issue a comprehensive operating or solid waste landfill permit. It may conduct some form of environmental impact assessment prior to the issuance of such a permit, and it may attach monitoring or other conditions to the permits.

Other local boards that may have jurisdiction over the land reclamation site are planning boards, zoning boards, and conservation commissions. The influence of these boards, however, may be minimized in those circumstances where a governmental entity is undertaking the project. In general, a federally-owned site will be exempt from local land use controls unless the federal agency voluntarily submits itself to local control. Other governments are usually immune from local zoning regulation, at least when they are exercising a "governmental" rather than a "proprietary" function. Waste management has generally been regarded in the law as such a "governmental" function, and there appears to be no reason to expect that the result would be different where the waste management involves land reclamation or biomass production as well.

Many land applications sites, however, will be neither owned nor operated by government entities, and thus will be subject to zoning. Although many local governments have declined to exercise zoning power over remote, sparsely populated areas where surface mines frequently are located, the extent and breadth of zoning control continues to expand. Thus, it is increasingly likely that a land reclamation project will be subject to zoning regulation.

Few (if any) local zoning ordinances will include land application as one of the listed land uses. Waste disposal, however, is a commonly listed land use, and is generally severely restricted to only a very small zone within a community. Thus, if a land application project is characterized as a waste disposal land use, it is quite possible that it will not be permitted in many zones where it may be suitable.

The argument that a sewage sludge land application project constitutes waste disposal is bolstered by the fact that such a project is treated as waste disposal for the purpose of the environmental regulations discussed above, and by the fact that, like conventional landfills, some of the concerns associated with the project remain after application is completed. On the other hand, land reclamation is not unlike other types of site preparation associated with any creation of new land uses. Site preparation itself is never considered a land use for zoning purposes, and is generally permitted if the ultimate land use is permitted. Under such a view, sewage sludge land application can proceed as long as the ultimate land use -- agriculture or forestry or the like -- is permitted. Such uses are, of course, among the most widely allowed. The latter argument has prevailed in the only reported decision to consider this issue, but there remains a substantial question of characterizing land application uses under each zoning regime.

General Legal Issues

Ownership of Application Site. A key problem in organizing a sewage sludge land application project is in sorting through the various land ownership interests associated with a particular site. Typically, in the case of surface coal mines, the land title is held by one party while a mine operator has purchased or leased only the mineral rights in the land. Thus, while a mine operator may have a statutory obligation under SMCRA to reclaim the land after surface coal mining operations are complete, it may be powerless to effect reclamation in other circumstances or to restrict the later uses of the land by covenant. These powers may remain with a site owner who may have few other assets.

A project sponsor will thus have to identify the appropriate ownership interests in a proposed reclamation site and negotiate agreements with such owners as seems appropriate. When the sponsor is a public authority with power to acquire land interests by eminent domain, this negotiation may be facilitated somewhat.

Easements and Covenants. An easement allows someone to use the land of another for a special purpose not inconsistent with the general property interests of the owner. A covenant is an agreement of two or more parties by deed in which one of the parties pledges himself to the other that something is either done or will be done. Each of these instruments may be needed if a proper, enforceable promise from the owner of the land is expected to restrict the property to certain uses.

As noted above, current EPA land disposal regulations require, in certain instances, that future owners of property to which POTW sludges have been applied be notified of high cadmium waste applications in the land record or property deed. There is an important difference, however, between giving notice that crops should not be grown on a particular property and recording a restriction of the property's use. A notice may remain recorded in the land record indefinitely, but is not legally enforceable in the way a restriction would be. A deed restriction, however, is enforceable only by the party owning the benefit of the restriction, and, in many jurisdictions, will be automatically extinguished after the passage of a certain period if it is not rerecorded.

Enforcement of such restrictions can, of course, be troublesome after the passage of time. Moreover, a problem associated with creating legally enforceable land restrictions is that some entity must be said to "own" the restriction, and only that entity will have the power to enforce it. This is true whether the owner conveys an easement restricting certain uses of the property or guaranteeing access to it, or alternatively records a covenant promising and requiring the necessary restrictions. The easement must, of course, be conveyed to someone -- the project sponsor or the local community, for example. The covenant, however, must recite the benefit received by the landowner in exchange for the restriction, and only the party who has given that benefit can enforce the restriction. Moreover, in many jurisdictions, the covenant must be attached to a particular parcel of land.

Thus, it will be no simple task to draft the legal document that may be necessary to restrict future land uses in order to gain agency approval for land reclamation of biomass production projects using POTW sludges or to respond to local concerns about the potential impacts of such a project. Nor is it always realistic to expect that such land use restrictions can be enforced in perpetuity.

Externalities from Operation. The fact that many land application projects using POTW sludges have faced opposition from abutting property owners indicates that such parties frequently believe that they will suffer, or are suffering unreasonable harm from the project at issue. If the project sponsor is a public body, these persons may legally oppose the project by asserting that it is effecting a diminution in the value of their property substantial enough to constitute a "taking" of value under the fifth amendment of the Constitution. Regardless of the identity of the sponsor, they may also argue that the project should be stopped as a nuisance.

In legal terms, a nuisance is more than merely a hurt, annoyance or inconvenience. The law of nuisance embodies two entirely distinct -- and arguably unrelated -- concepts. A public nuisance is "an unreasonable interference with a right common to the public".[12] Under this definition, land application will be considered unreasonable unless its utility outweights the gravity of the harm it produces. In contrast, a private

nuisance consists of an invasion of a person's interest in the private use and enjoyment of land. A private nuisance is actionable if it is either:

- intentional and unreasonable, or
- unintentional but negligent, reckless, or abnormally dangerous.

Under both nuisance concepts, the legal injury involved is a rough balance of the benefits and burdens derived from a particular activity. An activity will be actionable as a nuisance if its harms are not justified by its utility. A land application project using sewage sludge could thus be the subject of a nuisance action for a number of reasons. Certainly any allegation of air or water pollution, odors, or spills can be a sufficient basis for action. Alternatively, a nuisance case might allege that the land application was inappropriate by its very nature for the area in which it is or is to be located. Finally, a nuisance action may allege that insufficient ameliorative measures have been taken to reduce the harmful effects of the project, or that inadequate warnings have been given so that others may take such measures.

The alleged harms that arise from even proper operations of a POTW sludge land application project have been repeatedly noted. They include odor, water pollution or contamination, the attraction of rodents and other disease-carrying pests, and the raising of the heavy metal content of the soil. For each project under litigation, a court would have to make an individual determination concerning the magnitudes of these burdens, the availability and use of ameliorative measure such as incorporating sludges in the soils or applying dry rather than wet sludges, and the benefits to the public and to the land owner. Where the harms arising from an unreclaimed mine are substantial, the benefit of reclamation will be likely to outweigh its burden.

Indeed, if the focus of a "taking" or nuisance case is on the adverse effect of property values associated with a project, it should be noted that land values around a reclaimed surface mine may not be diminished at all. On the contrary, they may be increased.

Of course, very different conclusions concerning liability to third parties can be drawn where the evidence is that negligence was involved in a project. Such negligence might, for example, be the application of the sewage sludge to a spot that was not intended, permitted, or licensed to receive it. Insufficient monitoring of the project might also constitute negligence.

The law evaluates whether conduct is negligent by focusing on a "reasonable person" possessing ordinary skills and prudence. If the conduct alleged does not conform to what such a person would do under similar circumstances, then it is negligent. Obviously, any lawsuit alleging negligence would turn on its own peculiar facts, and the question of negligence would be resolved as a matter of fact by a jury.

SECTION 3

PAST EXPERIENCE

As part of this research effort, the staff developed case studies on the institutional and public acceptance aspects of a number of actual and attempted POTW sludge land application projects. The files were compiled from a series of telephone interviews with key project participants as well as from secondary sources.

The selected sites included most of the well-known sludge land application projects, as well as some which have received less publicity. In order to increase our sample size we also included several projects which involved land application of POTW sludge for agricultural purposes since the institutional and public acceptance issues raised by such projects are much the same. After eliminating from further analysis those case studies that were primarily demonstration projects, we analyzed the remaining 16 sites to determine if we could discern any significant patterns among them. Key information about all the case studies is presented in Figure 4. Individual case study summaries are included in Appendix A.

Permitting Process

The 16 case studies suggest that the actual procedures for obtaining approval of a land application project may differ from the procedures set forth in the applicable statutes and regulations. For example, even in the absence of a statutory requirement that project sponsors obtain the consent of the local community prior to obtaining a state permit, state regulatory agencies have demonstrated sensitivity to the wishes of the community which is to receive the solid waste. This informal policy has resulted in communities having *de facto* power over regulatory decisions, even which such power is not conferred by the law.

Where state law provides no formal mechanism for local regulation of a land application project, local governments may enact ordinances which give them control over project operations. Such ordinances have been passed even in the absence of clear statutory or constitutional authority for such regulation. When one county government, for example, authorized the county Board of Health to issue permits for the transportation, storage, use and/or disposal of digested and undigested sludge, a subsequent challenge resulted in the invalidation of the ordinance on the grounds that the county had exceeded its authority. Clearly, such actions by county governments can slow or stop project implementation.

Even when a single agency has sole permitting authority, the formal review process whereby that agency decides whether or not to issue a permit may involve several different independent agencies and offices within these agencies. The case studies indicate that the inability of various offices, either in one or several agencies, to agree upon a common policy regarding sludge application has complicated and hindered issuance of permits.

Figure 4

Case Studies

PROJECT	STATE	POTW GENERATING SLUDGE	PART OF A COMMUNITY WHICH IS PARTIALLY SERVED BY POTW	OUTSIDE OF POTW SERVICE AREA	TOTAL ACRES APPLICATION SITE	APPLICATION SITE OWNERSHIP		ABUTTING LAND USE			PROJECT SPONSOR		SLUDGE TYPE	SLUDGE % SOLIDS	PROJECT TYPE				TRANSPORTATION				AVERAGE MILES	DATE PROJECT PROPOSAL	STATUS			SLUDGE STORAGE AT THE APPLICATION SITE		APPLICATION SITE	
						PUBLIC	PRIVATE	HIGH	MEDIUM	LOW	PUBLIC	PRIVATE			AGRICULTURAL	RECLAMATION	BIOMASS PRODUCTION	OTHER	PIPELINE	TRUCK	RAIL	BARGE			PLANNING	FULL SCALE	INACTIVE	YES	NO	SINGLE	MULTIPLE
Vestel	New York	Binghamton	X		70-90		X		X			X	Vacuum filtered digested secondary sludge; lime & ferric chloride added	20%	X					X			4	1975		X		X		X	
Lowry	Colorado	Metro Denver	X		160	X			X			X	Vacuum filtration of anaerobically digested sludge	9%				X		X			25	1969		X		X		X	
Adams County	Colorado	Metro Denver	X		≈2000	X			X			X	Air drying of anaerobically digested sludge		X				X				25	1972	X			X			X
Fulton County	Illinois	MSDGC Chicago		X	15,528	X		X					Liquid digested sludge	10%		X			X			X	200	1969		X		X		X	
Wood County	Ohio	Toledo		X	2500		X		X				Vacuum filtered anaerobically digested sludge	21%	X					X			30	1973		X		X			X
Boone County	Indiana	Indianapolis		X	2600		X	X				X	Aged sludge	18%	X					X			50	1975		X		X			X
Somerset	Pennsylvania	Philadelphia		X	≈1000		X		X			X	Mine mix composted sludge and dewatered sludge cake	50%		X				X			200	1978		X			X		X
Savannah River Lab	South Carolina	Aiken County		X	18	X				X			Anaerobically digested heat treated sludge	30%			X				X		12	1979		X		X		X	
Palzo	Illinois	MSDGC Chicago		X	60	X				X	X		Liquid digested sludge	10%		X				X			300	1970		X		X		X	
Lewis & King Counties	Washington	Metro Seattle		X	100-1000		X			X	X		Anaerobically digested & dewatered by a polymer process	20%		X	X			X			50-100	1975		X			X		X
Franklin County	Pennsylvania	Philadelphia		X	650	X			X			X	Lagooned anaerobically digested sludge		X						X		150	1973			X	X		X	
Clearfield County	Pennsylvania	Philadelphia		X	1000				X			X	Lagooned anaerobically digested sludge	21-38%		X					X		150	1975			X	X		X	
Bucks County	Pennsylvania	Philadelphia		X	11			X				X	Digested (SW) sludge	Liquid	X					X			20	1976			X		X	X	
C&D Canal	Delaware	Wilmington		X	30	X				X	X		Anaerobically digested and air dryed	50%		X				X			20	1973			X		X	X	
C&D Canal	Pennsylvania	Philadelphia		X	400	X				X		X	Lagooned anaerobically digested sludge	21-38%		X						X		1975			X	X		X	
Grundy County	Illinois	MSDGC Chicago		X	1200		X		X			X	Aged (minimum 10 years) secondary sludge	12%	X						X		70				X	X			

Generally Applicable Public Attitudes Concerning Sludge

The case studies (and common sense) indicate that the willingness of a community to cooperate with a land application project varies with the community's perceptions of the project's potential benefits and costs. For a land application project to gain public acceptance, the majority of the community must determine that the reclamation or other benefits (e.g., monetary compensation) are greater than any burdens (odors, noise, truck traffic, etc.).

The major public acceptance barrier which surfaced in all the case studies is the widely held perception of sewage sludge as malodorous, disease causing and otherwise repulsive. These attitudes are a barrier to any beneficial use of wastewater or sewage sludges. Experience has shown that public apprehension on these points can be allayed somewhat - although not totally dispelled - through public education campaigns. Demonstration projects which provide first hand experience are an invaluable public education tool in this regard.

The case study experience also indicates that members of core opposition groups seize upon the public's lack of experience with wastewater or sewage sludges and attempt to propogate the view that sludge is repulsive in an effort to frustrate project implementation. It is also clear that there is an irrational component to public attitudes about sludge which means that public education will not always be entirely successful.

The relative novelty to the public of the concept and practice of land application of sludges may, in itself, be a barrier to public acceptance of such projects. Even after extensive public education by regulatory officials addressing the scientific data available to date, there often remain lingering doubts by the public about the safety of the procedure, based upon fears that the risks are not yet apparent. The growing awareness about hazardous wastes and the inadequacy of their past disposal practices will inevitably increase public skepticism about land application of sludge.

Transporting Sludge into Other Communities

In 13 of 16 cases studied, the sludge-generating authority used or wanted to use an application site outside its own sewage treatment district. In one case, the sludge-generating community attempted to secure access to a site in another state. The case studies demonstrate that a shortage of suitable application sites will frequently compel a sludge-generating authority to obtain land application sites beyond its jurisdictional boundaries.

The success of any sludge application project depends on the sponsor's ability to gain the cooperation of: (1) the site owner; (2) the abutting land owners; (3) the surrounding community; and (4) the responsible local officials. Transporting sludge into other communities tends to multiply institutional barriers. While a sludge

generating authority has extensive power to persuade, if not coerce, communities within its jurisdiction into accepting sludge, it has no such influence or control over other governments. Moreover, the opportunities for project opponents to obstruct project implementation by intervening in local regulatory procedures multiply when jurisdictional lines are crossed. When state lines are crossed, even greater barriers exist.

Success in obtaining use of an application site in another jurisdiction will vary with the ability of the project sponsors to anticipate and to resolve potential conflicts with local interests. There may be latent antagonisms between the sludge-generating community (often a large city) and the receiving (often rural) community. These rivalries may be the consequence of a variety of factors, including perceived cultural differences, political rivalry, and economic inequality. Whatever the history of the relations between the communities, the unresolved conflicts may well arise again when a project is proposed.

Ownership of the Site

Of the 16 cases considered, 6 projects were associated with attempts to obtain access to sites which were publicly owned (by federal, state, or local government) prior to the inception of the project. Four of these attempts succeeded in securing access to the sites.

In four other cases, the sludge-generating community purchased or leased sites from private land owners. Two of these projects have reached full scale operations, one project is attempting to overcome institutional and public acceptance barriers to implementation, and another project was frustrated by legal action which was unrelated to ownership of the site.

Six of the case study project designs involved efforts to use privately-owned sites which were to remain in private control throughout the project. Of these, three reached full scale operations, one was suspended because the private landowner withdrew from the project, and two others failed because of legal action or inability to obtain the required permits.

These results do not reveal any meaningful correlations between the identity of the application site owner and the success or failure of the projects. However, there are some interesting findings with regard to application site ownership and project initiation and operations. Authorities responsible for management of publicly owned sites may initially be more receptive to projects that the owners of private sites. This is particularly true with respect to federal lands, where some agencies have actively sought to become involved in land application projects. Indeed, in the case of the Savannah River Laboratory project in South Carolina, and the Palzo Project in Illinois, where successful land application projects have been conducted on federally owned lands, the initiative for the projects came from the federal agencies which had responsibility for management of the sites.

There is no apparent correlation between site ownership and the uninterrupted implementation of projects. The cases included one project where application on publicly-owned land was terminated after start-up and two cases where projects on privately-owned lands were interrupted after start-up. However, whereas the project on publicly-owned land was stopped by legal action initiated by local government, the projects on privately-owned land were stopped because the land owners of the application site decided to withdraw from the project.

It would appear that where the application site is owned by a private party, that private party constitutes a potential weak link in the project's operations. Such a land owner may, for personal reasons or as a result of public pressure, withdraw from the program at any time. For these reasons, a project promoter may wish to consider approaches which give them at least limited control over the site, such as leasing.

Abutting Land Uses

For the purposes of the cross-case analysis, the areas abutting the application sites were categorized according to use and density on a comparative basis as:

- low - forests, barren strip mine sites and sand dunes
- medium - active strip mining, low intensity farming such as grazing and ranching
- high - residential areas and intensive agriculture.

Five of the 16 land application sites were next to low-use/density areas. Eight sites were next to medium-use/density areas and three projects were next to high-use/density areas.

Public opposition to project implementation varied directly with the nature of the abutting land uses. Among the four cases where abutting land use was categorized as low, there was no significant public opposition to project implementation. Three of the four projects achieved full scale operations; the failure of the fourth project was directly attributable to a political decision not to permit importation of sludge from another state.

Among the eight cases where abutting land uses were categorized as medium, there were two cases where community groups actively opposed the project; five cases where individual abutters voiced opposition; and only one case where there was no significant public opposition. In three cases lawsuits were filed against the project. Five of the projects abutted by medium land uses achieved full scale operations; the failure of two of the other three was at least partially attributable to public opposition.

In each of the three cases where abutting land uses were categorized as high, abutters organized to oppose project implementation. Each of these projects became the subject of a lawsuit and failed as a result of legal action.

Public Relations

For this analysis, public relations has been defined as that component of the project which was designed to create favorable public attitudes. This is different from the public participation component where a public forum is provided for discussion of unfavorable as well as favorable aspects of several alternative projects. While public relations management strategies varied from case to case, concerted public relations efforts were made in at least 14 of the 16 case studies.

Public officials and private contractors involved in project planning often expressed the opinion that an effective public relations campaign was an essential component of a successful project. The attitude was also expressed that, while a public relations campaign did not ensure project success, failure to undertake a public relations campaign ensured project failure.

It was apparent that the importance given to public relations varied with the likelihood of significant public opposition. Projects carried out on isolated sites generally did not involve significant public relations efforts. Sites in densely settled areas or which were likely to be the objects of inter-jurisdictional conflict were the focus of extensive public relations campaigns.

Responsibility for Public Relations

Primary responsibility for conducting public relations campaigns falls either to public officials who have no particular training in the field (six cases) or to specialized consultants (eight cases). Five of the eight projects involving private contractors were eventually implemented as full scale operations, while only two of the six projects whose public relations were handled by public officials were similarly successful. Given the limited number of cases considered and the great number of variables which affect project implementation, caution is advised in drawing a correlation between responsibility for public relations management and project success.

The interviews with public officials and private contractors suggested that the contractors were often able to serve as a "buffer" or mediator between a wary and suspicious receiving community and the sludge generating authority. The case studies provide some indication that, where an inter-jurisdictional or public acceptance barrier was likely, the generating community recognized the need to enlist a private consultant. Three of the six cases where public relations were managed by public officials involved the use of relatively isolated, publicly-owned application sites which posed little risk of public opposition. However, six of the eight cases where public relations were handled by private consultants involved privately-owned sites in medium or high-use areas, with a high risk of vocal public opposition.

Specific Public Relations Techniques

There was a wide range of techniques which were used in connection with public relations campaigns, both by private and public promoters. These included distribution of brochures describing the project; public meetings to explain the project and to field questions from the public; lectures to citizens groups (e.g., Kiwanis Club, League of Women Voters); interviews with project officials on TV and radio; visits to demonstration projects; educational programs in the schools; and establishment of a "hot-line" telephone service to answer questions.

These tactics were used about as often for projects that failed as for projects that succeeded. No single or combined use of any set of techniques appears to be more effective than any other.

Public Relations Strategies

One of the 16 case study projects operates on the philosophy that litigation is to be avoided at all costs, even if it means the abandonment of particular application sites. The rationale for this strategy is that litigation, even if successful, results in negative publicity for land application of sludge. This publicity, in turn, tends to harden public resistance to project implementation when it is attempted at other sites. Adherence to this philosophy has resulted, however, in abandonment of between 40-50% of the application sites considered by the project.

The experience of several projects suggests that the effectiveness of public relations campaigns may be directly related to the timing and visibility of such campaigns. Several project managers expressed the opinion that public attitudes about a project tended to form and "harden" very soon after initial public disclosure. Moreover, the terms and issues of the ensuing public debate tended to be determined by the tone and content of the initial public disclosure. Hostile attitudes and misconceptions engendered by an unfavorable initial public disclosure may be difficult to allay by a subsequent public relations campaign.

The timing of public relations alone did not, of course, ensure a positive public response to project implementation. In one case where there was an early and aggressive public relations campaign, public opposition to the project proved insurmountable. However, seizure of the initiative by the project sponsor in the public debate over the advisability of the project can be one factor contributing to the success of the project.

It should be noted that some project managers disagreed with the proposition that public relations campaigns should be highly visible early in project planning. These people argued that a highly visible public relations campaign, in the absence of clear signs of public opposition, would in itself alarm and harden public opinion against the project.

The public relations campaigns of the various projects differed most markedly with respect to who was included (or excluded) as the objects of the public relations efforts. Some projects were narrow in scope: public relations were limited to the application site owner, or to the immediately surrounding community. Other projects made full scale efforts to win over local journalists, politicians, land owners, administrative officials, businessmen, etc.

Some public relations efforts may be described as passive, in the sense that there was little effort to reach out to particular segments or constituents of the public. Rather, information about the project was made available for individuals and groups which made the effort to obtain it. Other public relations efforts were designed to reach particular audiences and to win them over to support of the project.

Application Methods

It is difficult to say to what extent odors emanating from sludge may be imagined. However, it is the most common ground voiced by opponents in taking action against land application projects.

Of the nine projects studied which have reached full scale implementation, eight involved the use of aged or anerobically digested liquid sludge. Of these, the three which were in low land use areas proceeded with no adverse public reaction. However, the remaining five, which were surrounded by either medium or high land use, were plagued by abutting land owners' complaints of odors. In each case, administrative or court action resulted in modification to the application methods which ensured greater incorporation of the sludge into the soil.

Two of the three projects which reached the full scale implementation stage but were interrupted by litigation employed the use of liquid anaerobically digested sludge. In one case, the project management would have changed from spraying to direct incorporation if the courts had allowed continuation of the project.

Not surprisingly, the presence of storage lagoons near the application site also arouses public opposition. Six of the eight projects involving the use of storage lagoons became the object of lawsuits or administrative actions based on odor complaints. In two of these cases, litigation was directly related to the existence of the storage lagoons.

SECTION 4

STRATEGIES FOR PROJECT SPONSORS

Land application projects have been initiated by landowners, receiving communities, sludge producers and private contractors. In this section, we have summarized our research findings in terms of strategies for any of these parties interested in sponsoring a project. As the analysis of the case studies indicates, no one approach will guarantee public acceptance or regulatory approval of a given proposal.

Nevertheless, at least two general lessons were learned from the case studies. First, patience is required to implement a land application project. Second, for a wide variety of reasons, land application simply will not be acceptable on every site where it is technically appropriate. While no strategy can guarantee success, due consideration of the following issues should help sponsors reduce the risk that their proposed projects will not be approved.

Hire Experts

Some wastewater management authorities have found it useful to hand over various aspects of the project's promotion to specialized contractors. This step may be desirable in some cases, though it may not be essential. However, any project sponsor should investigate the possibility of hiring an expert to assist in the permitting process. In most cases, the retention of a local lawyer who can provide expertise on both the formal and informal requirements for obtaining local approvals is desirable. Certainly an environmental specialist familiar with the state regulatory procedures and staff would be helpful.

Reduce Risk of Public Opposition Through Proper Design

From the case studies, it is clear that the degree of public opposition to past projects has been directly related to the intensity of abutting land uses. The selection of isolated sites greatly improves the possibility of project acceptance. Similarly, the project should be designed to minimize any potential impact from odors. While soil incorporation greatly reduces odors from application of anerobically digested sludge, the use of an aged or thoroughly aerobic sludge form, such as properly composted sludge, should be considered. Also, extensive on-site storage of sludge in any form is not recommended.

Clarify the Incentives

When a land application project is proposed, one can assume that it is because the sponsor seeks to take advantage of some benefit to be derived from the project. Other parties, however, may stand either to gain or to lose from the proposal. By identifying who these parties are, the project sponsor can clarify for each what benefits they are likely to derive from the project and can develop strategies for altering the balance of such benefits against any project-related burdens (for example, by initiating compensation).

Based on the unique character of a given proposal the sponsor should make sure that everyone whose interests are served in any way is informed exactly how they will benefit. Figure 5 summarizes the possible incentives that various parties associated with a reclamation program might have.

Provide Indemnity and Obtain Insurance

In any land application project, the potential exists for some harms to project participants, property owners, workers or others, either out of some negligence or from statutory or regulatory violation. In either case, when personal injury or property damage occurs, tort claims and lawsuits are likely to follow.

In such a situation, an injured party normally has a selection of possible defendants, including the engineer that designed the project; the contractor that executed it; any subcontractors involved; the owner of the land; the operator of the mine; and the municipality that generated the sludge. Moreover, when only some of these defendants are named, they may bring others into the litigation by filing third party complaints. Any one of the defendants in a common lawsuit could conceivably be held liable for the entire amount of damages due -- even if that amount is out of proportion to the injury -- when other defendants fail or are unable to pay their share.

Because land application involves some undeniable risks, and because the precise nature and magnitude of those risks may be unknown, participants essential to a project may be reluctant to join. Although not used in any of the case studies, one way for a project sponsor to overcome such reluctance is to offer to indemnify such participants for any liabilities they incure or damages they suffer themselves, as a result of their participation.

The project sponsor is ordinarily in the best position to assess the risks of the project. Thus, if it can satisfy itself that the risks are outweighed by the benefits, it can provide reassurance to other participants by voluntarily assuming those risks. The indemnity agreement should explicitly state if the sponsor is assuming liability for even those harms resulting from the negligence of other project participants, since such indemnity may be demanded as a condition of participation.

Indemnity agreements do not preclude an injured party from bringing suit against the project participants perceived to be actually at fault in causing the harm alleged. Rather, they provide a conceptual basis for those participants to be reimbursed by the project sponsor. Such a contract may be worthless, however, if the project sponsor is without the financial resources to provide such reimbursement. In such circumstances, project participants are still liable to injured parties, and may be left without recourse for damages they had sought to shift to the sponsor.

FIGURE 5

INCENTIVES

(Assuming Everything Goes Well)

- Wastewater Authority
  - Alternative sludge disposal option
  - Sludge disposal at lower cost
  - Sludge disposal acceptable to EPA
- Active Coal Strip Mine Operator*
  - Meet reclamation requirements for less money
  - Less risk of reclamation failure
  - Prompt bond return
- Active Coal Strip Mine Site Owner**
  - Reclamation quality higher than required by OSM
- Other Application Site Owner***
  - Increase property value at low investment
  - Improved public image
  - Reduce conflict with water quality agencies
- Contractor
  - Business revenues
- Local Community
  - Improved aesthetic environs
  - Improved water quality
  - Increased tax base
  - Jobs and local business
  - Other compensation
- Abutters
  - Improved environment
  - Increased property values
  - Other compensation

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*Usually a mining company.

**May be the same as the operator or may be a different party who has leased or sold mineral rights to the mining company.

***Abandoned mines, mill tailing, dredge spoils, etc.

The obvious solution is insurance. By providing insurance for all harms arising out of a particular project, for a premium paid at the outset, a project sponsor can back an indemnity agreement with the security of a major insurance corporation, and thereby satsify any objections to the sponsor's ability to provide the indemnity agreed upon. In any case, a sludge-generating authority and specialized contractor should obtain professional liability insurance.

Compile Comprehensive Record

There are two reasons for a project sponsor to compile as complete a record about the project as practical.

1) A comprehensive record-keeping mechanism provides evidence that the sponsor has control over the project. It can therefore serve to reassure abutting property owners and the receiving community that every step possible is being taken to implement the project in accordance with a specific plan, to guarantee that the plan is followed, and to record the effects of the application of sludge as they are monitored.

2) In the event that something goes wrong with a land application project, the sponsor will be in a better position to explain and defend its actions -- and possibly avoid liability for itself and other project participants -- if it has prepared and maintained a comprehensive record. Since those who are thinking of participating in projects may be quite concerned with their potential liability, the existence of a mechanism for compiling such a record can serve as an inducement to their participation.

In addition to arranging for the compilation and maintenance of factual data about the design, operation and effects of the reclamation project, the sponsor should provide for continuous analysis of these data with as much critical objectivity as possible. Project design, inspection procedures, testing, quality control efforts, safety measures, and warnings should be scheduled for regular examination as critically and freshly as possible. The information contained in such evaluations, as well as accident or incident reports, should be widely circulated among project participants and within the community.

The sponsors should take care to avoid preparing a record that can be used unfairly against them. For example, care should be taken not to write a tentative report analyzing and incident or procedure that looks like a final report. Nor should a final report be written before all relevant evidence is gathered, especially if it is critical of present or past practices. Words that imply negligence should be avoided. For example, reporting that a lysimeter has "cracked" is more accurate and objective then stating that it "failed".

Comprehensive and Open Monitoring Program

While the details of a monitoring program will be governed by site-specific considerations there are some generalizations that can be made about monitoring programs. Monitoring serves two important non-technical roles. As discussed above, monitoring provides a much needed record, if there are questions in the future about the project. Monitoring also provides a means of allaying some of the public's fears about adverse impacts. For these reasons alone, regardless of their technical importance, monitoring programs should be carefully designed and conscientiously implemented.

The specifics of a monitoring program must be determined on a site-by-site basis. A comprehensive monitoring program should have three components: sludge quality, field operations, and environmental effects.

- Sludge quality should be assessed in two ways. First, it is important to know something of the historic composition of the sludge. At least a one year record of such compositional data as nitrogen, heavy metals and PCB content should be obtainable from the POTW. This information can then be used to establish loading rates. Second, a composite sample should be taken from the particular batch of sludge actually applied to a given site. Analysis of this sample should be recorded and evaluated to ensure that the heavy metals and PCB loadings were, in fact, within the limits specified in permits.

- Field operations are the procedures by which the site is prepared and sludge is applied. The state or local permitting agency may wish to have an observer at the site to ensure that the specified procedures are, in fact, followed. In any case, it is in the sponsor's best interest to encourage such observations.

- Environmental effects include project effects on ground water, soil water, soil, and vegetation. Pennsylvania, for example, has developed a relatively standardized monitoring program which calls for ground water, soil water, vegetation and soils monitoring at quarterly intervals for a minimum of one year. The decision as to whether or not to continue monitoring is then based on the results of the first year tests.

The question of who does the monitoring raises many credibility issues. In at least three of the case studies, the local community felt uncomfortable having to believe the project management's

results. Sponsors should not take these concerns as an attack on their integrity, but rather as legitimate concerns based on unfortunate past experience. A number of approaches can be used in the resolution of this issue.

- Probably most cost-effective is for the sponsor to arrange to have a third party perform the monitoring. This third party might be the local university or agricultural college, the state water quality control agency, the state department of agriculture, or a private laboratory. In any case, the project management can arrange to cover the costs of monitoring and use the results for their own records.

- Alternatively, the project management can offer to split samples collected with any of the regulatory authorities or public interest groups. The project management should be prepared to finance the duplicate analysis as well as their own.

- Finally, the local community can conduct a sampling program completely independent of the project's program. While this may seem excessive, it may also be politically necessary.

Public Relations Campaigns

As discussed above, there are no sure ways to gain public acceptance of land application projects, short of locating them in completely isolated areas. Where interaction with the public is projected, there are various techniques that may help the promoter to gain public acceptance.

While public relations campaigns are designed and carried out by the project sponsor to bring out a project's major benefits, candor is nevertheless essential in order to do this effectively. The case studies revealed a wide range of public relations techniques that have been used to promote POTW sludge projects, including development and distribution of glossy brochures describing the project; open public meetings; presentations to specific interest groups; presentation of films about similar projects; local media coverage; technical education campaigns for the public and in the schools; establishment of a hotline for quick response to individual questions; and presentation of materials stressing community benefits from the project.

It is important to design a public relations program which fits the character of the receiving community and the specifics of the application site. A major consideration is whether to take an aggressive or passive approach to public relations. There has been mixed success with both tactics. An aggressive campaign allows a sponsor to stay on the offensive and to conduct an effective technical education before project opponents can play upon public prejudices against sludge, but may also engender opposition where none would have existed otherwise.

The case studies show a direct correlation between higher density abutting land uses and the amount of public controversy. Thus, a passive public relations campaign should be implemented only in situations where the application site is relatively isolated. For other sites, which are likely to be controversial anyway, an aggressive public relations campaign is recommended.

Technical Education

Before local citizens can discuss the pros and cons of a proposed project they must become familiar with the technical aspects of a new field. A technical education program presenting the fundamentals of the land application process will enable various participants to ask questions. Unlike a public relations campaign which is directed at the community as a whole, technical education is directed toward a more limited audience with greater than average interest in the project.

It is likely that many with whom a sponsor deals will have had little or no experience with POTW sludge or land application. The first phase of this program, therefore, should be to explain exactly what will happen if the project is implemented: how the land is prepared; what time of year the sludge is applied; when a grass cover can be expected, etc. This is one point where reclamation projects have an advantage over some other land application projects. Since the sludge used in reclamation is generally only applied once, the public can be assured that any inconvenience due to traffic, dust or odors will be a one-time occurrence of very short duration. While movies on the general topic can be used to introduce the subject, it is important also to set out the specifics of the particular application proposal. Oral, written and visual materials should be prepared for presentation at public meetings.

The next important effort is to inform the public as to the high degree of anticipated compliance with state and federal guidelines and standards. These guidelines or standards should cover the following topic areas:

- Pathogen control
- Heavy metal content of sludge and soil
- Synthetic organic chemical content
- Storage facilities
- Application methods
- Site preparation
- Seeding methods
- Monitoring plans
- Deed restrictions

Where possible, standards of performance should be stated and the expected conformance of the project to these standards should be stressed. For example, with respect to sludge stabilization for odor and pathogen control, details of the composting process or anaerobic digestion process should be provided. For heavy metals, the composition of the sludge and the resulting soil and crop concentration of metals should be presented and comparisons made where possible. It is particularly important to compare the proposed loading with prescribed loadings as recommended in state and EPA guidelines.

It would be a good idea to enlist local experts, university researchers, or agricultural/forestry extention staff to assist with a public education effort in order to improve credibility of the project.

Advisory Panels

Another proven means of gaining credibility for a project and to defuse public opposition is to ask parties with a potential interest to participate on a project advisory panel. This is particularly useful in the case of the first site to be located in a general area. Governmental personnel with actual or de facto power of approval should be asked to participate along with representatives of the core opposition group, abutters and other groups. Such a panel provides a perfect mechanism for finalizing monitoring procedures and reviewing project progress. It also provides a forum for the settlement of disputes. Advisory panels have proven very useful during the facilities planning stages for a wide range of wastewater treatment options under EPA public participation regulations and appear to be particularly useful during the initial phases of a land reclamation project.

Demonstration Projects

Conducting a demonstration project does not guarantee that promoters will be able to expand a project to full scale. However, it is much easier to start a demonstration project than it is to start a full scale project. Once under way, the demonstration project sets the stage for a larger program. The sponsor may wish to plan a strategy whereby full scale operations can be reached after three or four years. Experience has indicated that a well-run demonstration program can help sell a full-scale project. Thus, a demonstration should be initiated if there is no ongoing land application project within a reasonable distance from the proposed site. A local demonstration program, preferably with extensive participation of local university researchers, will provide an excellent vehicle for educating the public about the process, and should receive local media coverage.

Such demonstration programs, when operated as a "pilot program" to develop full scale project design criteria may be fundable under the Step I facilities planning portion of the EPA construction grants process. We have identified a number of instances where such "pilot" scale wastewater treatment programs have been funded in this manner. Also, research funding to support demonstration programs may be available from EPA, other federal or state agencies. Otherwise, the costs of demonstration programs may have to be born by the project promoter prior to seeking assistance for establishing full-scale projects.

Compensation to the Receiving Community

In many cases, the recipient community may not have any incentive to provide the necessary project approval. In cases where public opposition is anticipated, the promoters should carefully examine the community's incentives and consider the possibility of modifying the project to increase them. Recent research[13] in the field of community compensation summarized the various methods into four major categories:

- Impact Prevention - This category covers the technical aspects of the project discussed under the strategy of proper design. To gain public acceptance a project sponsor must be sensitive to local concerns and be willing to modify practices to meet local requirements. Some modifications which might be considered are:

  - Location changes
  - Changes in sludge application technique
  - Use of dry rather than wet sludge
  - Truck route changes
  - Drainage control system
  - Buffer zone

- Impact Mitigation - These techniques are used to compensate a community or individuals for adverse impacts of a project which are unavoidable. Although the risk of such impacts is often very small, it is advisable to establish a mechanism to provide compensation just in case. It is very unlikely that this form of compensation will be required for land application projects.

- Side Payments - This form of compensation involves the payment of a benefit to the community to offset any burdens. These payments may be in the form of direct monetary payments or may be more indirect. One approach is transfer of a service or amenity to the community which is the direct result of a land reclamation project. For example, a portion of the reclaimed site could be deeded to the community as a park. Side payments may also be possible in the form of local economic support. For example, consider the maximum use of local resources such as local trucking firms, local labor, and local merchants.

- Contingency Management - This is the method of local compensation most commonly used in reclamation projects to date. Sponsors use these techniques to reassure the community that the project is well managed and that procedures have been established to deal with problems. Providing the local community not only with access to the site for purposes of monitoring but also providing them with funds to conduct an independent monitoring

program has been a key to project acceptance in the past. Such independent monitoring programs can be financed either directly or through a tipping fee on each truck load of sludge brought into the community. Other methods used to reassure the local communities include posting of performance bonds, purchasing of liability insurance, and establishing a "hotline".

CONCLUSION

While no one is going to say that gaining approval for land application projects is easy, it is certainly possible, it may, in fact be no more difficult than gaining approval for other types of wastewater and sewage sludge management projects. Sponsors who are patient, taking the time to properly design projects, to conduct demonstrations, and to provide public education programs, will most likely be able to successfully establish projects.

At this time, the only note of caution is that land application as a management option is very vulnerable. Public acceptance of the concept is growing with every successfully implemented project, but it might only take one disaster to shelve the technology. Thus, while dealing with the red tape of federal guidelines and state permit requirements may be frustrating, it will be worthwhile if projects perform well.

With the number of disturbed areas in this country increasing daily, the potential for sewage sludges in reclamation and biomass production projects is enormous. If projects implemented during the next five years demonstrate that the procedures not only work, but can be conducted in a publicly acceptable manner, it is quite likely that land reclamation and biomass production will become a more widely used method of recycling sewage sludges. Land owners may then begin to assume an increasing share of the overall project costs.

REFERENCES

1. 33 U.S.C. §§ 1251 et seq.

2. 33 U.S.C. § 1281(d).

3. See EPA's regulations under the Clean Air Act (CAA), 42 U.S.C. §§ 7401 et seq., dealing with new stationary sources of air emissions, 40 C.F.R. Part 60, and with hazardous pollutants. 40 C.F.R. Part 61. See also EPA's Toxic Substances Control Act (TSCA), 15 U.S.C. §§ 2601 et seq. regulations on PCBs, 40 C.F.R. Part 761, and the recently promulgated hazardous waste regulations under the Resource Conservation and Recovery Act (RCAA), 42 U.S.C. §§ 6901 et seq., 40 C.F.R. Parts 260 et seq.

4. See EPA's ocean dumping regulations, 40 C.F.R. Parts 220-230, promulgated under the Marine Protection, Research and Sanctuaries, 33 U.S.C. §§ 1401 et seq.

5. See EPA's PCB regulations, 40 C.F.R. Part 761, and its solid waste disposal regulations, promulgated jointly under RCRA and the CWA at 40 C.F.R. Part 257. See also EPA's hazardous waste regulations, 40 C.F.R. Parts 260 et seq.

6. See EPA's solid waste disposal regulations, 40 C.F.R. Part 257, and the forthcoming regulations on distribution and marketing of sewage sludge products, to be codified at 40 C.F.R. Part 258.

7. 33 U.S.C. § 1345(d).

8. 42 U.S.C. §§ 6907, 6944. These standards appear at 40 C.F.R. Part 257.

9. 40 C.F.R. Part 258 (forthcoming).

10. 30 U.S.C. §§ 1202 et seq.

11. 42 U.S.C. §§ 4321 et seq.

12. Restatement (second) of torts § 821B.

13. "A Handbook for States in the Use of Compansation and Incentives in the Siting of Hazardous Waste Management Facilities" (Draft), September, 1980, prepared by USR&E for EPA.

APPENDIX A

Case Study Summaries

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VESTEL, NEW YORK

I. Background

The treatment facility in Binghamton serves a population of 120,000 and is mutually owned by the City of Binghamton (56%) and the Village of Johnson City (44%). In 1973, the rising cost of landfilling the sludge forced the Joint Sewer Board to evaluate new alternatives. Based on success stories of land application programs in Chicago and Denver and the economic attractiveness of such programs, the Board decided to contract Sludge Disposal Services, Inc. (SDS), owned by Neil Guiles, to land apply sludge at a cost of $33/dry ton (presently SDS receives $65/dry ton). The liquid digested sludge is dried to approximately 20% solids by vacuum filtration. Metals contents average on a dry weight basis, 115 mg/kg CD, 1250 mg/kg Cu, 650 mg/kg Pb, 19,000 mg/kg Fe.

Since the project's start in 1975, Guiles has used two trucks of 5,200 and 6,000 gallon capacity to transport the sludge four miles from the plant to approximately 100 acres of farmland in the Town of Vestel. According to the manager of SDS, 40 acres of land are owned by Neil Guiles' father and SDS leases the other 60 acres from farmers. The sludge is stored in a 3-4 million gallon lagoon before it is sprayed and disked under the soil surface. Sludge is spread from April to the end of November.

Approximately 40 acres of land is used to grow corn and hay for livestock feed. However, SDS is presently examining the possibility of selling the crop to gasohol researchers and thereby avoiding the problems and questions concerning livestock uptake of heavy metals.

Sludge has been applied at a rate of 15 dry tons/acre in accordance with EPA guidelines for nitrogen and cadmium concentrations for individual applications, but the present site has exceeded recommended Cd cumulative loading rates. The Treatment Plant Superintendent claims that 200 additional acres are needed and there is no room at the present site for expansion. The site is adjacent to a few privately owned farms and homes and a few acres of forested land owned by a local realtor. The only incident which required halting application was one in which some sludge accidentally ran on to the realtor's property. A complaint to the Broome County Health Department was referred to SDS, which in turn halted application and cleaned up the sludge.

II. Litigation

There has been no litigation related to this case.

III. Legislation

There has been no legislative action taken as a result of this case.

IV. Regulation

The key state regulatory agencies include the New York State Departments of Environmental Conservation (DEC), Agriculture and Markets, and Public Health. On the local level that Broome County Department of Health is involved, but only to the extent that it refers problems to the regional office of the DEC. The major problems in the Binghamton case have resulted from the lack of communication and coordination among agencies as well as major disagreements within the agencies as to the proper regulatory actions to be taken.

The only permit presently required for land application of sludge in New York State is based on Part 364 of the New York Code of Rules and Regulations which deals with sludge hauling (commonly referred to as a waste scavenger permit). In the future, according to an associate Sanitary Engineer with DEC, a contractor will need both Parts 364 and 360 permits. Part 360 deals with waste disposal site regulations. The DEC has full responsibility for permitting and is the major regulatory agency in this case.

The DEC first became aware of high levels of cadmium in the Binghamton sludge in the fall of 1978. At that time, DEC proposed that the sludge disposal operation could continue only if consent orders were negotiated between the DEC and all communities contributing to the Treatment Plant, the Joint Board, and Neil Guiles. The City and Neil Guiles decided not to negotiate a consent order since the order specified a tight deadline for site closure. The City Engineer informed the DEC of their intentions and arranged for all parties to meet in the DEC office in Albany. As a result of the meeting, a considerable amount of time and effort was spent by the City and its consulting engineering firm to obtain a Federal grant which would pay the cost of groundwater and other tests necessary to satisfy DEC. A lot of time was spent negotiating testing requirements with DEC so that the Federal grant, which had to be approved by the Construction Grants Division of EPA and the DEC, complied with DEC's Permit Section. However, in June 1979, when the DEC backed down on its original insistence that the site be closed, Guiles signed the consent order. The City still objected to a stipulation in the order requiring that no crops grown on the farmland enter the food chain, but made arrangements to buy SDS' crop at market value. The City sold the crop to a local farmer after tests were done which indicated that there was no danger of toxic metals problems in the crop. The City was prepared to take the State to court on the issue, but with the issuance of the U.S. EPA Interim final requirements in September 1979, the State said it was prepared to vacate the consent order.

The consent order was issued in absence of any state or federal regulations specifically related to SDS's operations, but contained an "escape clause" which stated that the consent order would become null and void in the event that federal or state guidelines for land application were finalized into regulation. When the federal regulations were established in September 1979, SDS and the DEC Regional Attorney, found the sludge disposal operation to be in compliance with the new regulations. However, DEC's Division of Solid Waste Management, declared that because the federal regulations were only interim-final, the consent order should remain in effect. The DEC Regional Attorney responded to this by saying,

"The fact that the area in question is characterized as interim-final, does not change the fact that they are fully enforceable as final."

As part of the federal regulations, Guiles is required to submit a statement to DEC declaring that the crops grown on the sludge amended soils are used only for animal feed. However, the Regional Engineer for Environmental Quality (in charge of issuing scavenger permits such as the one SDS is seeking) states that he has not been authorized to request or acknowledge such a statement.

The Binghamton case is such a political hot potato that other agencies seem to avoid active involvement. When high cadmium levels in the Binghamton sludge were first measured, DEC asked the other two agencies for some determination. After 6 months of inaction, the DEC decided to use its own consent order mechanism to control the situation. In addition, the DEC has been able to exert further controls by imposing additional monitoring requirements as part of the State grant stipulations for all sewage treatment plants in the State (New York is the only State which pays a portion (33-1/3%) of facilities' operation and maintenance costs).

Although the state agencies are unwilling to take any enforcement action, the Department of Agriculture and Markets has been very verbal on the subject. The State of New York is presently trying to make its own sludge regulations through the public hearing process. Representatives of the Department of Agriculture and Markets have attended the hearings to protest the new regulations, saying that they are not stringent enough in terms of allowable cadmium concentrations and have asked for a 2 year moratorium on land spreading operations. Cornell University Department of Agriculture representatives, on the other hand, have attended the hearings to express the opposing view. Estimates are that it will be early 1981 before the State's sludge landspreading regulations are finalized.

V. Political and VI. Local Government

A professor at the State University of New York at Binghamton (SUNY), researched cadmium uptake in various types of corn. An English professor at SUNY read a 1977 progress report on the project and became alarmed at the levels of cadmium cited. He has complained several times to DEC and writes to the editor of the local paper about his concerns of a cadmium problem. Interestingly, his home is located on the road which Guiles' uses to truck the sludge to the site and he is apparently also opposed to having the trucks pass his house.

The local governments of Binghamton and Vestel are in favor of land application in that it is the cheapest way to dispose of the sludge. State legislators have made inquiries at DEC concerning the difficulties that have arisen, but have not made attempts to do much more than suggest that the DEC keep things moving in the regulatory process.

VII. Interest Groups

No groups as such are involved in the project. The campaigns of individuals have apparently not caused any arousal of public concern. Except for the isolated incident described above, none of the landowners abutting the site have complained about the sludge spreading operations (there are only 2 or 3 others owning land directly adjacent to the site).

VIII. Public Participation and Public Relations

There is no organized public relations program in Binghamton.

IX. Technical Issues

The major issue has been that of cadmium accumulation in the soil and possible uptake in the corn grown on the farm. As described in the regulation section, the DEC would not allow the corn to be used as livestock feed until each harvest was analyzed. Cornell studies proved that there was no uptake of cadmium in the grain -- only in the leaves.

There was some discrepancy as to how much cadmium had been added to the soil by the sludge application. While SDS was supposedly spreading on all 100 acres, and cadmium concentrations in the soil were conservatively calculated based on 85 acres. In practice, SDS had applied the sludge to only 56 acres. As a result, the calculated levels were lower than the levels actually present at the site.

There have not been problems with pollution of ground water or runoff in this case.

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Albany, New York 12233
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LOWRY AND ADAMS COUNTY, COLORADO

I. Background

This case study examines the experience of Metropolitan Denver Sewage Disposal District No. 1 (Metro) with sludge application to land. For eleven years Metro sludge had been applied to a site owned by the City and County of Denver at the old Lowry Bombing Range site in Arapahoe County Colorado. Metro is also proposing a sludge drying and distribution center in Adams County.

Metro is an authority serving 21 agencies in the Denver metropolitan area, with its central plant located in Adams County. The plant, originally built in 1966, and recently expanded, provides activated sludge secondary treatment for 170 million gallons per day. Sludge was incinerated at the original facility until 1971 when rising fuel costs, mechanical, and air pollution problems resulted in a switch to land application at the Lowry site. In 1972, when the plant expansion was proposed, land application of sludge was the recommended plan. However, this was such a controversial issue that officials decided to proceed with the construction of the wastewater treatment facilities expansion and to study the question of sludge management further. As a result of these studies, Metro has proposed the Adams County sludge drying and management project.

A. Lowry Site

Since 1969, Metro has been transporting sludge to the Lowry Bombing Site by truck. The sludge was spread on the land in strictly a disposal mode. Cattle ranches and small wheat farms abut the Lowry site, although there is a residential development within a mile and a half of the site. Metro pays the City and County of Denver $2.00 per dry ton of sludge disposed of at the site. The City sanitary landfill is near the application site and the whole area will be restricted to park or recreational land use after the operations are complete. Although the Lowry application site is not in the service district itself, 46 percent of Arapahoe County (where Lowry is located) is served by Metro. A Metro official commented that he could see Lowry becoming part of the service district in the future. Funding for the Lowry project is entirely from user charges. There have been complaints of odors due to application of unstabilized primary sludge at the Lowry site. These odor problems have been solved by mixing the sludge with soil.

B. Adams County Site

Metro's consultant, CH_2M-Hill, recommended a plan to pipe the anaerobically digested sludge from the Central Plant, which is located in Adams County, to 600 acres of drying beds also in Adams County. After drying, the sludge will be used on public lands (parks, open space, etc.) and sold to area farmers as a fertilizer. The rate schedule for the sale of this sludge has not been established, but will be based on nitrogen content. Metro would like to make a total purchase of 2000 acres in Adams County and would use the land not designated for drying beds for a buffer zone, demonstration plots and distribution facilities. Design on the project was 95% complete in 1977. Construction on the project is awaiting a Certificate of Designation for the operation of a Solid Waste Site and Facility from the Adams County Commissioners. Under

Colorado State Law all solid waste disposal facilities, which the drying and distribution facility is considered, must receive a Certificate of Designation before the operation can begin. A hearing to determine whether or not the certificate should be awarded is scheduled for January 13, 1981. Although design on the project is 95% complete, it will have to be updated and completed before construction can begin.

Construction is estimated to start six to nine months after the Certificate of Designation is approved. The cost of the project is estimated to be $40 million (1978 $).

Abutters to the proposed drying site in Adams County are predominanly dry land farmers in a very remote area. The proposed drying basin site is not within the treatment plant service district, although 74% of Adams County is. Metro had to get a partial condemnation order so that it could perform geotechnical studies on land proposed for the drying beds.

II. Litigation

Litigation in this case seems to be hazy at best. At the Lowry Bombing Range site there have been no real issues of litigation, but there have been public hearings before the Arapahoe County Commissioners. These hearings have been requested by the abutters to the Lowry site who have complained of odors. Metro and the City and County of Denver, who own the land, have made requested adjustments (mixing the sludge with soil to stop odor problems).

In Adams County, Metro brought local land owners to court to obtain access to land for geotechnical studies. Adams County District Court awarded partial condemnation rights of the drying bed site in Adams County so that Metro could carry out the necessary geotechnical studies to get the project underway. In other court action, Metro brought Adams County to court saying that under current law, Metro did not need a Certificate of Designation for its sludge drying beds. Metro's rationale was an amendment to Colorado's Solid Waste Act which says in effect that beneficial uses of sludge are not considered solid waste disposal facilities, and therefore, do not need a Certificate of Designation. The court ruled against Metro saying that Adams County was within its rights in requesting a Certificate of Designation for the drying bed sites.

III. Legislation

The State of Colorado Solid Waste Disposal Sites and Facilities Act was amended in 1976 to allow beneficial uses of sludge without a Certificate of Designation. Metro, the League of Women Voters, Keep Colorado Beautiful and other environmental groups proposed the change. Although not proposing the amendment, the State Department of Health favored it. The farmers abutting and owning the Adams County drying bed sites were opposed to the amendment feeling that Adams County was being used for waste disposal without receiving the benefits that surrounding counties were.

IV. Regulation

In this case, the primary regulatory agency is the State Department of Health. At the Lowry Site the State provides technical assistance in the form of monitoring, but allows Metro to set its own application rate. At the Adams

County site, the State Department of Health is responsible for implementing the EPA construction grants program. The State has promulgated land application guidelines this year (1980). In promulgating these guidelines, the State Health Department staff researched similar guidelines promulgated by EPA, Illinois and Ohio. Metro does not feel that the State regulators have been inconsistent, but rather that they move slowly. Metro attributes this to the lack of technical capabilities and manpower the State has for dealing with the sludge problem, and does not believe the new State guidelines will cause any major changes in the way Metro handles the project. The major permit required for the project is the Certificate of Designation needed for the sludge drying bed site. The process involved in obtaining this certification includes:

- The Adams County Commissioners' review plans and sends them to the State Department of Health;
- The State Department of Health reviews the plans and comments, then sends them back to the County Commissioners;
- The Adams County Commissioners hold a public hearing to again review plans (January 13, 1981) and to determine whether or not the certificate should be awarded.

V. Political

There are four key interest groups and one research institute involved in the land application project in Adams County. The interest groups include the League of Women Voters, the Keep Colorado Beautiful Environmental Group, the Adams County Chamber of Commerce and a loosely knit group organized to oppose the project. The League of Women Voters and the Keep Colorado Beautiful Group both favor the project, while the Adams County Chamber of Commerce is willing to endorse the project if Metro will carry out some recommendations that they have put forth. The research institute involved is the Colorado State University.

Currently, the local county government seems to be opposed to the project. The past county commissioners were opposed to the project, but two of the current county commissioners are new and have yet to take a stand. At EPA hearings, the Adams County Planning Commission has voiced opposition to the project on behalf of the County Commissioners. They have done this even though many of them personnally favor the project. The opposition of the Adams County Commissioners to the project fits historical patterns of Adams County residents fearing that the county is becoming a waste disposal site for the metropolitan area.

VI. Local Government

As stated in the Political Section of this report, the Adams County Government has traditionally been opposed to this project even though county residents have become more receptive over time. The past commissioners did not feel that they had played a significant enough role in the planning of the project. The Planning Commission felt that this criticism was unjustified and suggests that being opposed to the project has been a very popular political stance.

VII. Interest Groups

The four key interest groups involved in this case are:

- o Keep Colorado Beautiful
- o League of Women Voters
- o Adams County Chamber of Commerce
- o A loosely organized opposition group.

The loosely organized opposition group is made up mostly of area farmers. The group formed a couple of years ago to oppose a landfill that was proposed for Adams County. The Keep Colorado Beautiful Group and the League of Women Voters, both of whom are in favor of the project, were influential during the draft EIS review process as they furnished petitions supporting the project.

The Adams County Chamber of Commerce said they would support the project if Metro would:

- o Provide more sewer service to rural areas in Western Adams County;
- o Completely rebuild (rather than patch) all streets the pipeline goes under in Commerce City;
- o Research land application sites farther away from Commerce City.

According to the Adams County Planning Commission, Metro has balked at these suggestions, while Metro maintains that some of the requests were not legally feasible. For example, the idea of extending service was not feasible because Metro is not allowed to extend outside the planning area and still receive grants.

VIII. Public Participation and Public Relations

There has been public participation and public relations programs both at the Lowry and Adams County sites. Robert Bardwell, then of Landfill, Inc., contractor for the Metro District, (later absorbed by BFI) was in charge of the public relations program at Lowry. Mr. Bardwell said that this program included;

- o research and extensive preparation;
- o hiring a journalist for professional PR work;
- o four public meetings;
- o taking city and county officials to Chicago to show them demonstration plots;
- o use of the media and brochures;
- o use of experts for credibility;

- meeting with and informing political figures so that they could answer their constituents' questions.

The major weakness in the program, as noted by Bardwell, was a failure to meet with and inform key members of the political party that was not in office at the time.

In Adams County, there was a public relations program when the project was conceived in 1972, but there has been little evidence of one in recent years. Del Calzo Associates of Denver was retained by Metro for public relations activities. Although not officially part of the public relations program, Metro has also been running a program where school children are given tours of the wastewater treatment works. This program has helped to make the concept of wastewater treatment and solids reuse more acceptable to the children and also their parents. Also, Metro held monthly meetings in Adams County to keep the public informed and created an advisory board of interested citizens. This board was active during the planning stages, but has been relatively inactive during the years of project review.

Drawbacks to the public participation/public relations projects in Adams County include:

- the project's long review period (3 years to develop EIS and 1-1/2 years of State review) has made it hard to keep the project in the public mind;
- Metro's technical explanations are offset by the emotional perceptions.

IX. Technical Issues

Actual contents of sludge from Metro's Central Treatment Plant have never been challenged, although many people were initially suspicious because sludge from most cities the size of Denver contains high levels of heavy metals and PCBs. There has been a concern that application rates at the Lowry site are too high, but no legal regulatory action has been taken.

One regulatory requirement imposed by EPA that differed from the recommendation of CH_2M-Hill and Metro was that all of the Adams County drying beds be lined to prevent leachate. CH_2M-Hill and Metro were opposed to this because the geotechnical studies and the USGS confirmed that the groundwater table was sufficiently deep and protected by impervious materials overlaying it such that groundwater contamination was not an issue. The EPA held the ultimate power in the form of money and therefore won out.

The farmers were originally opposed to the project saying it would do more harm than good. However, this was at the beginning of the project when they thought Metro would own the application sites and lease the sites back to them. Since Metro opted to sell sludge to the farmers, the farmers' views have changed and many now support the project.

CONTACTS: Adams County Planning Commission
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Brighton, Colorado 80601
(303)659-2120

Denver Department of Public Works
City and County Bldg.
Denver, Colorado
(303)575-3224

Department of Resource Recovery and Reuse for Metro
6450 York Street
Denver, Colorado 80229
(303)289-5941

Colorado State Health
4210 East Eleventh Street
Denver, Colorado
(303)320-8333

Delcalzo Associates
Denver, Colorado
(303)388-4081

DNS Associates
1901 L. Street, N.W.
Suite 616
Washington, D.C. 20036
(202)466-7755

CH_2M-Hill
Water and Wastewater Division
Box 22508
Denver, Colorado 80222
(303)771-0900

FULTON COUNTY, ILLINOIS

I. Background

Citizens of Fulton County, Illinois have been concerned about the effects of strip mining in the county for many years. The first collective action was taken in 1969, when the County Board of Supervisors (The Board) and the State's Attorney's Office formed a special citizens committee. The group discussed the pending strip mine landfill proposal in Livingston and Stark Counties, and directed the State's Attorney to investigate the feasibility of such a project in Fulton County.

It was apparent from the studies of the landfill project that, although it would effectively level the mined area, some measures would have to be taken to modify the inorganic mine spoil material covering the landfill. It was then that the use of digested sewage sludge for soil rehabilitation was proposed. Subsequently, the County Planning Administrator and the Board investigated the sludge project underway in Arcola to determine whether Fulton County should consider such a process. As a result of this and further investigations, a resolution to negotiate a similar project was proposed, and approved by The Board in a 30-0 vote.

The Metropolitan Sanitary District of Greater Chicago (MSDGC) made a presentation to the Fulton County officials on September 11, 1970, and conducted a tour through the MSDGC facilities in Chicago. The Mines and Mining Committee of Fulton County undertook a series of discussions with various mine operators and the MSDGC attempting to organize a reclamation project in Fulton County. The objective of the discussions was a lease arrangement between Fulton County and a mine operator simultaneously with a lease-back arrangement between Fulton County and the MSDGC. However, before any such contract could develop, a private landowner negotiated and sold his 5,461 acres directly to the MSDGC.

The MSDGC is a municipal corporation responsible for the treatment of wastewater from 123 communities within Cook County, Illinois. The main treatment plant involved in the Fulton County Land Reclamation Project (or Prairie Plan) is the West-Southwest Plant in Stickney, Illinois. According to an April 1975 analysis, the digested sludge resulting from the secondary treatment at the plant consists of 3-4% solids, 750 mg/g Pb, and 175 mg/g Cd dry weight. The sludge is barged 200 miles down the Illinois River to Liverpool, Illinois, by a New Jersey barging firm, Modern Inland Limited. From Liverpool dock, the sludge is pumped out and relayed 10.8 miles via underground pipeline to four large clay-lined holding basins for storage. Dredge equipment is used to mix sludge to uniform consistency and solids content of 6% or less before pumping to the distribution system. Sludge was originally applied using traveling sprayers, but soon switched to a direct soil incorporation system for better odor control. MSDGC halted operations at the Fulton County site only once since construction began in January 1971, while awaiting permit approval to apply supernatant to the fields.

Since the initial land purchase, MSDGC has added to its holdings and now (1980) owns 15,528 acres of land in Fulton County. The average price paid has been $300 per acre as compared to an average market value for farmland

in the county of approximately $2000. No future land acquisitions are foreseen by the MSDGC. The entire cost of the Prairie Plan has been borne by the MSDGC.

The land uses abutting the application site include row crop farming, livestock grazing, and strip mining.

II. Litigation

As of December 12, 1975, a number of legal actions have been filed both by and against the MSDGC. In Ripper vs. MSD and Co. of Fulton, various local residents have sought injunctive relief against the Prairie Plan and damages for alleged odor nuisance. MSDGC considers this case closed since the plaintiffs have not pressed further actions.

IEPA vs. MSD (Mr. Parkhurst) is an enforcement case of the Illinois EPA before the Pollution Control Board, charging air pollution violations against the Prairie Plan during 1974. The case was held in discovery, with the assertion of attorney-client privilege concerning withheld documents delaying the conclusion. There has been no action on this case in the pursuing years.

MSDGC filed MSD vs. IEPA as a permit appeal on March 27, 1975. However, at the MSDGC request, any hearing or determination on the part of the Pollution Control Board has been stayed, pending disposition of the above case.

In another case of MSD vs. IEPA, a mandamus action was brought by the MSDGC to compel the issuance of its 1975 Fulton County comprehensive operating permit. A hearing was set for October 28, 1975 on the question of whether IEPA can withhold documents from discovery on the assertion of attorney-client privilege. The case has been inactive in recent years.

MSD vs. IEPA - there is an appeal by MSDGC from certain conditions imposed in its Gale and United Electric permits issued by IEPA (Gale and United Electric properties are a recent MSD acquisition). The Fulton County citizens group intervened in the action. This case has also been inactive in recent years.

III. Legislation

A Fulton County Board of Health Permit, which locally governed transportation, storage, and use of digested sewage sludge, was repealed at the July 8, 1980 County Board meeting because permitting processes had been preempted by State statutes. Currently the County has authority only to establish ordinances for undigested sewage sludge (septage). Before repeal, the permit fees provided funds so that the County was able to do independent monitoring of the project. With the source of funds terminated, the role of the County in the monitoring program will likely change.

IV. Regulation

The MSDGC must comply with three sets of standards in order to construct and operate the project:

- Illinois EPA Water Pollution Control Permit

- o General Water Quality Standards of the State of Illinois

- o Fulton County Board of Health Permit which governs transportation, storage, use and disposal of digested and undigested sewage sludge. (Note: as of July 8, 1980, this permit is no longer required. -- See "Legislation".)

V. Political and VI. Local Governments

The official local government policy has been receptive throughout the project. According to Robert Carlson, senior engineer for the Prairie Plan from 1973 to 1975, the Prairie Plan became an issue in the elections of members to the Fulton County Board of Supervisors. Several members were reportedly elected to the Board because of their strong stands against the project. It has been alleged that once elected, the Chairman of the Board appointed the new members to committees which dealt with issues totally unrelated to the Prairie Plan.

The Fulton County Board was the initial promoter of the project. The Fulton County Citizens for Better Health and Environment (CBHE), according to its leader Melba Ripper, has been disappointed by the responses it has received from both the Board and the local government officials.

The USDA and the University of Illinois have conducted research in Fulton County on heavy metals in the sludge and their effects on crops.

VI. Interest Groups

Many of the 25-30 abutters to the site and other members of the area communities make up the Fulton County CBHE. The group, formed at the start of the project, has actively served as the opposing voice to the Prairie Plan. The group's leader, who represents the group's concerns on the Fulton County Steering Committee and the Fulton County Board of Supervisors, asserts that the MSDGC bought not only strip mined land, but perfectly good farm land as well. Project staff notes that landowners often offered single parcels with both disturbed and undisturbed portions. For this reason, CBHE filed a $1 million suit against MSDGC based on odor nuisance. Although the suit was filed in Fulton County, it is being heard in Cook County in keeping with the law. CBHE is concerned that because the case is being heard in MSD's home territory, the outcome will be in favor of the MSDGC.

Another action initiated by the group involved a drive to get 25% of the registered voters in the county to sign a petition to place a referendum on the ballot that whether or not sludge should be imported into the county. However, the petition was judged illegal due to the improper wording of the petition.

Other group activities include a booth at the yearly local fair, public meetings, stories in the media, and a coverage on the 60 Minutes television program.

VII. Public Participation and Public Relations

The MSDGC has established an extensive public relations program. In

1974, MSDGC hired Ross Advertising, Inc. of Peoria, Illinois to conduct the program. One of the primary reasons for hiring a firm in southern Illinois was to have a MSDGC representative nearer to the Fulton County site. It was felt that a local firm could get a better sense of public opinion, respond more quickly, and would have existing contacts with various media representatives. The MSDGC outlines all ads and brochures, allows the firm to do the layouts, and then reviews all materials before printing. In addition, the MSDGC conducts lectures and tours for interested groups and runs a project progress report column regularly in the local paper.

The MSDGC has attempted to actively involve the public while simultaneously ironing out difficulties among the various agencies and interest groups through the establishment of a Steering Committee. The membership of the committee includes local officials, interested citizens, and representatives of government agencies. The following is a list of the groups represented on the Steering Committee.

- MSDGC (Sponsor and Chairman)
- Fulton County Board (Co-Sponsor)
- Illinois Department of Business & Economic Development
- Illinois Department of Conservation
- Illinois EPA
- Western Illinois Regional Planning Council
- University of Illinois
- Fulton County Health Department
- Fulton County Planning Commission
- City of Canton
- City of Cuba
- City of Lewistown
- Soil Conservation Service
- Fulton County Citizens for Better Health and Environment

The Steering Committee initially did not allow CBHE to be represented at their meetings because the Committee felt the meetings would be too technically oriented for the citizens group. Since 1974 project staff have encouraged CBHE attendance. However, CBHE claims that the Steering Committee has no real input in the developing of the Prairie Plan other than distributing information. The project staff feels that the Steering Committee provides the best sounding board for public sentiment...and an excellent communication link between the agencies involved and the project management.

Some of the reclaimed land has been used for Big Bluestem -- a MSD plan designed to re-establish native prairie plants and animals as part of the Prairie Plan. The Big Bluestem Advisory Committee allows for citizen participation in the project. Also, MSD has leased 440 acres to Fulton County for a public conservation area and 1,480 acres to local farmers for crops, hay, and pasture. It is applying sludge to about 2000 acres which includes 747 acres of row crops.

VIII. Technical Issues

With the promulgation of the federal guidelines for land application, cadmium content and cumulative loading rates have become a real issue at the Prairie Plan. Research has been conducted on the cadmium uptake of crops grown on sludge reclaimed soils and the MSDGC is actively campaigning to have the maximum cadmium loading limits raised.

Application methods have been changed from spraying to soil incorporation in order to reduce odors. The MSDGC anticipates a shift from liquid sludge to dry sludge in the future because of increasing transportation costs.

CONTACTS: Metropolitan Sanitary District of Greater Chicago
100 East Erie Street
Chicago, Illinois
(312)751-5720

Prairie Plan
P.O. Box 457
Canton, Illinois
(309)647-5135

Fulton County Citizens for Better Health and Environment

WOOD COUNTY, OHIO

I. Background

In 1973, the City of Toledo, Ohio was ordered to stop landfilling sludge from its activated sludge secondary treatment plant which is located in Loucas County and serves the communities of Toledo, Northwood, Wallbridge, and Rossford. It was proposed by the Ohio State EPA that the vacuum filtered anaerobically digested sludge, which is 21% solids, 16 ppm cadmium and 3 to 4 ppb PCB's, be applied to farm land in the surrounding area. Soil Enrichment Materials Corporation (SEMCO) became the first contractor engaged by the City. SEMCO spread sludge on private farms in nearby counties for the City of Toledo during the period from 1973 to 1976. It was a particularly stormy period in the life of the project as poor management of a central sludge storage area caused odors which brought an abatement order from the Wood County Health Department. When SEMCO's contract expired in 1976, it was not renewed. A contracting firm lead by Mr. Jim Perry was engaged to carry on the project.

Mr. Perry's firm hauls 22 to 24 tons of sludge in specially-designed trailers (with baffles and anti-spill lifts) an average of thirty miles to rural areas. None of these areas are within the Treatment Plant Service district. Perry charges the farmers $25/acre for application of five or six dry tons/acre. Application rates are predetermined by Ohio State University on a P fertilizer basis, and Perry plans one application per site every 7 to 9 years. There are restrictions, however, on what types of crops may be grown on the land; for the first three years no root type vegetables may be planted, and for the first five years no tomatoes or leafy vegetables may be planted.

Perry has developed a sludge storage system which has reduced odor problems. A temporary storage lagoon with a lime base is constructed at each application site. Sludge is stored in this temporary lagoon for six to eight weeks during periods of inclement weather and at the end of that time both the sludge and lime are applied to the farmland.

II. Litigation

There were a number of complaints about odors from the central storage facility that SEMCO maintained in Wood County when it was running the project. Because of these complaints, the Wood County Health Department issued an abatement order for SEMCO to take corrective measures at the storage facilities. SEMCO appealed this order to the Franklin County Court of Appeals who upheld the appeal on the basis that that Wood County Health Department did not give due notice of the abatement order and therefore did not give SEMCO ample time to refute the charges. The Wood County Health Department issued another abatement order this time giving due notice. SEMCO filed another appeal, but their contract ran out before the case was resolved.

The appeals were heard in Franklin County Court instead of Wood County Court because under Ohio law a company foreign to Ohio (SEMCO) has the right to appeal in a different jurisdiction and SEMCO opted to do this, feeling that it was in their best interest.

III. Legislation - None

IV. Regulation

The state approves plans for wastewater treatment plans and under this program they review plans for sludge handling procedures. However, once the plan is approved, there is no real regulatory mechanism. The only reports that can legally be required by the Ohio EPA are those under the NPDES permit program. The Ohio EPA also requires reports on the monitoring of the sludge including what is in it and where it goes, however, the legality of this is in fact presently being challenged in court.

Ohio has promulgated guidelines recommended in the Ohio State University Cooperative Extention Program Bulletin 598 and has adhered to these guidelines in plan approval.

V. Political - None

VI. Local Government

The local governments in the land application areas have been very receptive. The only real opposition occurs if a nuisance situation arises.

VII. Interest Groups

The local soil conservation people have become involved in the project and have shown opposition only in the case of a nuisance situation as with SEMCO.

VIII. Public Participation and Public Relations

There was never an organized, planned public relations programs as such. SEMCO gave talks in Wood County and developed a brochure. Jim Perry, the present contractor, attended several meetings in the area and runs tours. The City of Toledo gave presentations dealing with sludge application to the local 208 planning agency. The project has been very well accepted in the county except when nuisances arise (SEMCO developed brochures when odors began) and a public relations program has not really been necessary.

IX. Technical Issues

None of the persons interviewed felt that the chemical content of the sludge has been an issue in this case. The sludge is applied primarily as a P fertlizer source and incorporated into the soil during application to reduce the potential for odors.

CONTACTS: Ohio Environmental Protection Agency
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1035 Devlac Grove Drive
Bowling Green, Ohio 43402
(419)352-8461

Bayview Water Reclamation Section
3900 North Summit Avenue
Toledo, Ohio 43611
(419)247-6545

Jim Perry
8636 Yawbarg Road
Whitehouse, Ohio 43571
(419)875-6162

BOONE COUNTY, INDIANA

I. Background

In 1975, the Environmental Protection Agency advised the City of Indianapolis that it would have to expand and upgrade its Belmont Wastewater Treatment Plant in order the meet NPDES permit requirements. In order to accomplish this expansion, the City had to drain ten storage lagoons where sludge had been stored for as long as 43 years. The City received bids from many companies that proposed to use a variety of sludge management techniques. In December 1976, the City awarded a contract to the Tousley-Bixler Construction Company, that had proposed land application of the sludge for agricultural use in Boone County, Indiana, located 50 miles northwest of the City. Tousley-Bixler subcontracted with Organic Materials, Inc. of Lebanon, Indiana, to conduct the sludge application operations, and Coastal Tank Lines of Akron, Ohio, to transport the sludge from the Belmont plant to Boone County.

Coastal Tank Lines used a system of tags that stated sludge characteristics (% solids, etc.) and destination of the truck. On reaching the Boone County site, the sludge was transferred either to Organic Materials, Inc. landspreading vehicles or storage lagoons. The storage lagoons were for use during inclement weather or during times of the year when spreading was not allowed, and eventually became the subject of litigation, causing a temporary suspension of the project. In addition, Coastal ran into trouble with angry citizens in Boone County, who once shot at and one other time ran their cars into the Coastal Tank Line trucks.

Restrictions placed on the project and application sites included:

- sludge could not be spread on frozen ground or directly on growing crops;
- only corn and soybeans could be planted in the first crop year following sludge applications;
- no forage could be removed or cattle allowed to graze for one year following sludge application.

In addition to these restrictions set by the Indiana State Board of Health Health, the farmers would not allow sludge application in the spring so that the ground could dry for planting. This limited the sludge application season from late September to the middle of November. The contractor planned to charge $22 per acre for sludge application.

The analysis of the sludge from eight of the Belmont lagoons indicated PCB concentrations in the range of 10 to 20 mg/g, cadmium concentrations in the 150-200 mg/g range and arsenic concentrations averaging 25 mg/g. Two of the Belmont lagoons had PCB concentrations in the 60 mg/g range, which were considered unacceptable for landspreading by the Indiana State Board of Health.

The land application system was initiated in spring 1977, with the first applications occurring in September of that year. Funding for the project is under the EPA Construction Grants Program, paying 75%, the State, paying 10%, and the City of Indianapolis, paying 15% of the total 12.1 million dollar project.

II. Litigation

In June 1977, abutters to the storage lagoon in Boone County filed suit to gain an injunction on the project. There seems to be some confusion as to the make-up of this abutters group. The south lagoon is abutted predominantly by a bedroom community and the north lagoon abutted by farmland. The suit was filed before the project even began, with odor, groundwater contamination, pests and property devaluation being cited as potential problems the lagoons could cause. The suit seemed to have a number of underlying causes, depending on whom you talk to. According to the Indianapolis Department of Public Works, the primary reason for the suit being filed was that the storage lagoons were not in the original design, and not because the abutters were opposed to the entire project. This view is opposed by Organic Materials, Inc. who alleges that the storage lagoons were in the Environmental Assessment done prior to the project.

While the Boone County Health Department claimed that the suit was brought by the abutters because of their wholehearted opposition to the project, and that the abutters would not have been happy with anything short of an injunction, Robert Penno of the Indiana State Board of Health indicated that he thought the abutters biggest concern was that the lagoons would be permanent. Although explanations given for the suit varied, there were two points on which all parties agreed: the project could not proceed until the suit was settled and that the suit was eventually settled out of court. The out of court settlement called for:

1. EPA's final grant payment was to be withheld until the Boone County storage lagoons were removed and the sites returned to their natural state.

2. Tousley-Bixler (the main contractor) was required to establish and monitor wells at the lagoon sites.

3. The State would pay for and perform monitoring of residential wells in areas adjacent to the storage lagoons.

While the storage lagoons in operation, there have been no complaints about odors. There have been complaints about groundwater contamination, which when checked were found to be invalid. There have also been complaints about land application of sludge on unpermitted areas and inappropriate application techniques. These allegations were investigated and found to be invalid. The project has been completed with no additional applications anticipated.

III. Legislation

There was no legislative action involved in this case.

IV. Regulation

Being the first large scale operation of its type in Indiana, the Indianapolis project has suffered through the process of the state regulatory agency gaining its first experience with land application technology. The three regulatory agencies involved were the U.S. EPA, the State Board of Health, and the Boone County Board of Health. EPA helped provide money in the form of a construction grant and therefore had considerable power. In Indiana, the Construction Grants program is managed by the State Board of Health, which sets limits and adopts guidelines for projects. County Health Departments in Indiana are more or less the local branches of the State Health Department, but with no regulating powers of their own.

Regulation in this case was a controversial issue due to fairly tough limits on cadmium and PCB, as well as the types of crops that could be grown and when sludge could be applied. The original accumulative cadmium limit of 1 lb./acre was a stipulation of the agreement between Organic Materials, Inc. and the State. This low limit resulted in extensive land requirements. The U.S. EPA used guidance suggestions for cadmium applications of 1.875 lb/acre cumulative after the original agreement between the State and Organic Materials, Inc. had been drawn up. The State subsequently modified its limit to 1.875 lb/acre. Only sludge with PCB concentrations less that 60 ppm could be landspread; this precluded use of the sludges from two of Belmont's ten lagoons. The 60 ppm limit on PCB's is more stringent that the limit imposed in other states.

EPA Region V (Chicago) would not allow sludge to be applied during the winter months because of potential problems with runoff. This was inconsistent with other EPA regional offices, notably Region VII (Denver), where winter application is allowed. In addition to contaminent concentration and winter spreading limits, the State also imposed limits on what crops could be grown, allowing only corn and soybeans. In addition to the above restrictions, monthly reports are required on groundwater and crop monitoring operations.

All parties involved seemed to agree that the state was reluctant to get involved in a sludge management practice that it had limited knowledge about. Small scale landspreading of sludge had been going on, essentially unregulated, for years in Indiana, but there had never been a need for clear guidelines. The state wanted to protect itself from a possible suit as evidenced by the fact that it made each of the contractors take out liability insurance.

One other comment that did surface and may be true on a national basis was that many of the project problems resulted from the high turnover of EPA Regional personnel. Private contractors often found themselves briefing new regulatory officials about their project as well as land application of sludge in general.

V. Political

There were basically two political groups that affected the project. These groups were the abutters to the Boone County storage lagoons and Dr. Lee Sommers of the Purdue University Agronomy Department. Dr. Sommers was very supportive of the project, and his role was to give the project credibility. The storage lagoon abutters were opposed to the project for a variety of reasons. Depending on whom you talked to, these reasons included:

- Persistent odor, pests, groundwater contamination and property devaluation;
- They thought the lagoons would be permanent;
- They were entirely against the project.

VI. Local Government

According to the Indianapolis Department of Public Works, the Boone County Health and Planning Boards were very receptive to the project and remained that way. This view was substantiated by the Boone County Health Department, however, because of strong public opposition and Organic Materials, Inc. going out of business, the Board will look very hard at any new projects.

VII. Interest Groups

The primary interest group involved in this case were the abutters to the storage lagoon in Boone County. They were formed for the sole purpose of opposing the project and filing the suit complaining of odors, pests, groundwater contamination and property devaluation, before application of sludge even began. It was during the early stages of the project, before operations got underway, that this group was most influential. The costly delays caused by the law suit may have been a contributing factor to Organic Materials, Inc. going out of business.

Although not as vocal as the storage lagoon abutters, there was a considerable number of people favoring the project.

VIII. Public Participation and Public Relations

Organic Metals, Inc., the contractor in charge of land application operations, took on the primary responsibility for public participation and public relations. The company did extensive research on other land application projects in the country, noting in particular any litigation or questions raised. Organic Materials, Inc. hired the public relations firm of Howard S. Wilcox, Inc., of Indianapolis. Together, these two companies developed a public relations program that included:

- Public meetings in which pots of sludge were placed under participants' chairs without their knowing it;
- Press releases;
- Literature;
- Question and answer newspaper columns;
- Demonstration plots;
- Dr. Lee Sommers of Purdue as an expert witness;
- A film of the Boone County operation for future use by Organic Materials, Inc.

The strong points of the public relations program were supplying Boone County officials and key farmers with background materials, keeping interested environmental groups informed, and above all, being open and honest with all parties involved. The County Health Board was most impressed with the amount of good and bad information about sludge application that Organic Materials, Inc. supplied.

The only criticism of the public relations program that we found was that Organic Materials, Inc. presented the project in such a manner that the public got the impression that it was a sure thing.

IX. Technical Issues

There were several sludge analyses done, including one by Organic Materials, Inc. during the bidding period for part of the contract. The State Board of Health didn't really believe the numbers from previous analyses and therefore asked Tousley-Bixler to carry out a new sampling program with the Regional Environmental Protection Agency (Chicago) doing the analysis. An unusually hard winter enabled Tousley-Bixler to get more representative samples from the middle of the lagoons. The Tousley-Bixler-EPA analysis found more heavy metals and less nutrients than the previous studies suggested. However, none of the studies results varied significantly. The EPA, State, City and the contractors sat down and had no problem agreeing with the Tousley-Bixler-EPA analysis.

There were many technical questions that were brought about during the course of the project. As mentioned in previous sections, the cadmium application limit was called into question and evenutally changed. In addition, whether or not to apply sludge to land during the winter and the need to test lagoon liners were technical issues brought into question. On the issue of testing lagoon liners, Organic Materials, Inc. complained that the State required an inordinate amount of testing. Organic Materials, Inc. tested the lagoon liner with a sludge that was five percent solids, with no leachate being produced. The State required them to initiate further tests with sludges that were three and one percent solids, resulting in costly delays for no benefits, since the Indianapolis sludge contained at the very least eight percent solids.

There didn't seem to be any variation in the opinions of the farmers regarding the benefits of the sludge. Their major concern was possible odors and plant toxicity, in that order.

Several parties had responsibility for monitoring during this project. Tousley-Bixler conducted a special sampling of the sludge lagoons with analysis performed by the regional EPA office. Soil analysis was subcontracted out to a private laboratory. Groundwater monitoring at and around the Boone County lagoons was performed on a monthly basis. The 4" wells at each storage lagoon were monitored by Tousley-Bixler and all residential wells within a 5-mile radius were monitored by the State Board of Health.

CONTACTS: Indiana State Board of Health
Water Pollution Section
1330 West Michigan Street
Indianapolis, Indiana
(317)633-0775

Indianapolis Department of Public Works
2700 South Valenout
Indianapolis, Indiana 46221
(317)634-2030

Boone County Sanitarian
416 West Camp Street
Lebanon, Indiana 46052
(317)482-3942

CONTACTS: (Cont'd)

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Agronomy Department
West Lafayette, Indiana 47907
(317)749-2891

Tousley-Bixler Construction Company
2916 Bluff Road
Indianapolis, Indiana
(317)783-3371

Resource Recycling Systems Inc.
1499 Bay Shore Highway, Suite 120
Burlingame, California 94010
(415)692-5792

Howard S. Wilcox Inc.
143 W. Meridian Stre t
Indianapolis, Indiana 46204
(317)634-1171

SAVANNAH RIVER LABORATORY PROJECT

I. Background

Sutdies are being conducted at the Savannah River Plant to evaluate the cost effectiveness and environmental effects of using sewage sludge to aid in reclaiming disturbed lands and to increase biomass production in pine and hardwood plantations. The land restoration program is an effort by the Savannah River Laboratory, Aiken, South Carolina, Savannah River Forest Service and the Savannah River Operations Office of the State Department of Health and Environmental Control to develop methods for reclaiming land on the Savannah River Plant site that have been disturbed since construction commenced on the site. Studies already performed by the Southeastern Forest Experimental Station have demonstrated that the nutrients and organic matter in sewage sludge increases fertility and improves growing conditions for vegetative cover on the disturbed soil sites.

The forest productivity program is investigating areas of environmental concern associated with growing trees for energy resources, using sewage sludge as a fertilizer and soil conditioner. The environmental studies will determine the effects land application of sewage sludge has on the hydrologic cycle and cycling of nutrients, heavy metals and organics for forest ecosystems. A cost-benefit analysis of using sewage sludge as a fertilizer and soil amendment will be made by determining the increase in wood fiber production under varying amendment regimes and comparing it with sludge handling expenses.

The sources of sewage sludge will be two local wastewater treatment plants. The Horse Creek Pollution Control Facility is a 20 MGD capacity treatment plant with estimated sludge production of 20 wet tons/day. The sludge is thermally conditioned and dewatered following aerobic digestion. The Augusta Municipal Wastewater Treatment Plant produces 50,000 gallons per day of anaerobically digested sewage sludge. These wastewater treatment plants will be reimbursed the additional costs of transporting the sewage sludge to the Savannah River Plant.

The application sites are within the Savannah River plant, a 300 square mile facility owned by the U.S. Government and managed by the Department of Energy (DOE). The land restoration sites are former borrow pits and the forest prodution site is an existing 18-acre plantation. The Savannah River plant, approximately 12 miles from the treatment facility, is not within the Aiken County service district. The sludge, which contains approximately 30% solids, is transported to the application site in 20 ton capacity trucks owned by the Aiken County Public Service Authority. There are storage facilities on the site sufficient to hold 2-3 weeks of the county's total sludge production.

The project was conceived in 1979. The first application was conducted in the fall of 1980. The project is funded by the DOE as part of a biomass productivity study. Under the terms of the project grant, all of Aiken County's sludge will be applied to the Savannah River Plant site for two years.

II. Litigation - None

III. Legislation - None

IV. Regulation

The Savannah River Operations Office of the State Department of Health and Environmental Control required that DOE apply for a permit to use the site and to transport the sludge. Variation of application rates is permitted up to a maximum of 50 dry tons/acre. The Department has no set guidelines for sludge application.

V. Political/Local Government

No involvement thus far, except for Public Service Authority.

VI. Public Relations

There has been no concerted public relations campaign, although local officials have been informed of the project's existence. There are tentative plans to conduct a public meeting to explain the project once it is operational.

VII. Monitoring

Ground water monitoring has been required with a minimum of one upgradient and two downgradient wells. Ground water samples will be collected quarterly with a complete metals analysis being performed on an annual basis. The DOE is responsible for the project although it is being carried out by its contractor, E.I. DuPont De Nemours and Company.

CONTACT: Savannah River Lab
Aiken, South Carolina 29801
(803) 450-6211

THE PALZO PROJECT

I. Background

In 1966, the USDA - Forest Service (Shawnee National Forest) purchased 313 acres of strip mined land in Southern Illinois from the Stone Fort Mining Co., Inc. 190 of the 313 acres were inactive strip mines which did not support vegetation. The remaining 123 acres was forested.

In 1970, the Illinois Sanitary Water Board directed the Forest Service to correct the health and environmental hazards created by acid mine drainage at Palzo. Later that year the Forest Service applied treated municipal waste to a 1/4 acre test plot. Results pointed to the sludge applications as an extremely effective reclamation tool. A final environmental impact statement describing sludge treatment was completed in July 1972. The statement incorporated and documented the inputs of local residents, universities, and governmental agencies at the local, State and Federal levels.

In 1974, the Metropolitan Sanitary District of Greater Chicago (MSDGC) awarded a $2 million contract to the Great Lakes Plumbing and Heating Company to excavate, transport, and apply 216,000 cubic meters of anaerobically digested municipal sludge to the Palzo tract. Peabody Coal Company, the owner of much of the land adjacent to the site, provided a railhead and pipeline right-of-way necessary for delivery of sludge to the site. From 1974 to 1977, sludge was transported approximately 300 miles by rail from MSDGC's Calumet facility. At the Peabody railhead sludge was unloaded into a lagoon from which it was pumped 4 miles to the site. The sludge was incorporated into the soil by means of disk application.

According to the Research Project Leader, the Forest Services' contract with MSDGC called for sludge applications to only 60 acres of spoils. No federal or state monies were used specifically for the project. However, much of the levelling was accomplished through a federal Job Corps program which used the tract as a training site for heavy-equipment operators prior to the start of the project. The Forest Service aided in site preparation and has served in an administrative role throughout the life of the project. Also, the Forest Service issued a $50,000 research grant (pass-through EPA funds) to Southern Illinois University to study vegetation grown on the sludge amended spoils.

No sludge has been spread since 1977 and the 15 applications plots have all been planted with a permanent cover of trees, perennial rye, tall fescue, and orchard grass. The Forest Service had considered acquiring sludge from cities such as Carbondale and St. Louis which, being closer to the site, would make transportation more feasible. However, sources other than the MSDGC have been dropped from consideration for various reasons. The next phase of the project will involve the use of dry sludge as opposed to the liquid sludge (10% solids) used in the 1974-1977 applications, because the dry sludge will be easier to use from a logistics standpoint.

II. Litigation

There was no litigation in this case.

III. Legislation

There was no legislative action involved in this case.

IV. Regulation

All regulatory agencies have been involved since the start of the project. According to project staff, the U.S. EPA, state and local public health departments, the Illinois Environmental Protection Agency (IEPA), and the local planning agency have all been supportive of the Palzo Project.

The IEPA participated actively in the project design and monitoring specifications and required that an operating permit be issued to the private contractor, Great Lakes Plumbing and Heating. In addition to contract obligations to MSDGC and permit responsibilities to IEPA, the contractor entered into a cooperative agreement with the Forest Service. In this way, responsibilities were outlined for the excavation, transportation, and incorporation of MSDGC sludge at Palzo consistent with reclamation needs defined by the Forest Service--each step performed with the environmental precautions specified by IEPA.

A Forest Services' monitoring plan was integral to granting of the contractor's IEPA permit. The Forest Service sampled four surface-water sources and eleven groundwater monitoring wells with point-in-time samples taken on a regular basis. Sample frequencies and parameters were specified in the plan, with a monthly report of operations and monitoring to IEPA as a key element. The monitoring program provides long-range, baseline information separate from cooperative research investigations designed to answer specific questions.

Regulatory requirements became more stringent over time in that prior to the project there were no state or federal regulations specifically related to strip mine reclamation. As the project progressed federal land application guidelines were established, but there were still no state regulations concerning reclamation. The regulations governing the Palzo Project consist of the federal guidelines and the state licensing requirements for the hauling and disposal of sludge.

V. Political and VI. Local Government

The local government and the public have been very receptive to the Palzo Project. The neighboring communities stand to gain nothing from the reclaimed lands, except, perhaps, the elimination of a long-time eyesore and productive National forest land. In addition, the project is still, for the most part, surrounded by more strip mined land. There are no odors or surface runoff to the area's homes and farmlands. Finally, the Forest Service was effective and timely in promoting the project to the public as well as involving all interested and affected parties in the project from the very beginning. In conclusion, the Palzo Project is non-controversial. The usual reasons for dispute found in other cases are not present in Palzo, Illinois.

The University of Illinois, Southern Illinois University, and the University of Kentucky have all conducted various research projects involving the Palzo Project.

VI. Interest Groups

The Sierra Club is the only group which has expressed a continuing interest in the Palzo Project and their response has been extremely positive and supportive.

VII. Public Participation and Public Relations

The Palzo Project public relations program was organized and promoted by the Forest Service. The program began with lectures to all interested groups and local governments before the start of the project. The Forest Service staff presented research results and described the operation to the public through the media, open meetings, and site visits.

The keys to the program's success were its early start and good organization. The following list of facts shows the organization and diversity of the Palzo Project's P.R. program.

During 1977, the Palzo Project was:

- visited by 30 groups--a total of 439 people;
- the subject of four off-site presentations, attended by 410 people;
- the subject of two local T.V. programs;
- the subject of at least five feature articles in newspapers and magazines;
- the subject of several technical journal articles;
- the subject of requests for information from every state in the country and several foreign countries.

VIII. Technical Issues

Highly acidic and toxic leachate was flowing into Sugar Creek which runs adjacent to the spoils prior to sludge applications. The amount of these leachates has dramatically reduced since reclamation. Research on the original test plots showed that a great deal of sludge is required--as much as 300T (dry)/acre. Applications began in late May and ended in September or October each of the project's four years.

The only issue involved concerns the pattern of uptake of metals in animals and the longevity of vegetation planted. However, at least 10-15 years will be required before these issues can be resolved.

IX. Monitoring

MSDGC was responsible for performing analysis of the sludge applied to the Palzo site. Soil has not been systematically monitored throughout the project although the Southern Illinois University has performed analysis on

the plots it has monitored. The Forest Service has taken the lead in water quality monitoring by sampling 11 on-site wells and 4 stream locations, some as frequently as every month.

CONTACT: Lands, Watershed, and Minerals Officer
U.S. Forest Service
316 East Poplar Street
Harrisburg, Illinois
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LEWIS AND KING COUNTIES, WASHINGTON

I. Background

The Municipality of Metropolitan Seattle (Metro), began diverting effluent discharges from Lake Washington to the Puget Sound in 1976. Until 1971, sludge was discharged into Puget Sound in response to requirements of the 1965 Water Quality Act. Since then, Metro has developed a strategy of testing the feasibility of as many sludge utilization options as possible. Currently, a long-range utilization plan is being developed and should be completed in 1981.

Metro serves 33 cities and sewer districts in King County and parts of Snohomish County. At the present time, solids handling occurs at the West Point Treatment Plant in Puget Sound where the sludge is anaerobically digested and dewatered by a polymer process to 18% solids. The resultant sludge contains 55mg/dry kg of cadmium, 1,784mg/dry kg of zinc, and 1,018mg/dry kg of copper. All aspects of this program have been financed by Metro.

In one feasibility study sludge was hauled by a private contractor in open top trucks to the application sites. There was limited storage capacity at the application sites. One site Metro has used for this purpose was a strip coal mine which is not within the Metro service area. This 1,000 acre site is in Lewis County, approximately 96 miles from Seattle, and is privately operated. The site is abutted by timber and farmland. Storage and application has been the responsibility of the mine operator. This project was conceived in 1975, and the sludge has been applied since 1977. In conjunction with the mine operator, Metro is currently examining the potential of long-term sludge application.

In another study sludge was applied to a 100 acre site, which is a privately owned mine in King County, roughly 50 miles from the treatment facility. This project was conceived in 1978, and in 1979 approximately 60% of the site received sludge application. Metro assumed the entire cost of this project.

Other utilization sites include a Christmas tree farm, a community college in an urban area, park lands, and an ongoing research program conducted by the University of Washington at the Charles Lathrop Park Experimental Forest.

II. Litigation

There was no litigation associated with these projects. There is no policy to withdraw a site from consideration when legal action against the site appears likely, as this has never occurred.

III. Legislation

Two years ago, the Washington State Legislature amended the State solid waste law to define sludge as solid waste. This amendment was designed to bring State law into conformity with Federal law and EPA regulations. The effect of the legislation has been to bring regulation of sludge within the jurisdiction of county health officials. As yet, however, administrative rules governing disposal have not been formulated at either the State or local

levels making the regulatory situation highly uncertain. The legislative change did not effect the projects discussed here.

IV. Regulation

As indicated above, the County Boards of Health are primarily responsible for the regulation of sludge. Some county boards have declined to exercise their authority, while others require solid waste landfill permits prior to land application. Such a permit process would require an Environmental Impact Statement and a monitoring program. In the cases discussed here, there was no formal permitting process. Rather, the county boards concerned were notified of the project, and the terms and conditions of the application were agreed upon informally. State Environmental Checklists are completed for each of the sites which are not considered research projects.

V. Political/Local Government

The gravel mine site had to be approved by the Metro Council, Metro's executive board. A committee of the council is kept informed concerning project status and new site opportunities. Appropriate local agencies are contacted prior to project initiation.

VI. Public Relations

Metro attempts to inform the affected population concerning the nature of the projects to be undertaken in their area. In addition, a public participation component is being developed for the long-range utilization plan.

VII. Technical Issues

In the early 1970's it was felt that the chemical content of sludge had become an issue with regard to agricultural applications. As a result, Metro abandoned its attempts to utilize agricultural sites. In addition to the use of sludge for land reclamation, Metro is focusing a considerable amount of effort on the use of sludge in silviculture. The application method is site specific.

Sludge samples from Metro's POTW and sludge/soil samples from project sites are continually analyzed, in addition to surface and groundwater monitoring. Currently, a comprehensive, 18 month monitoring program is being implemented, which will provide complete data on sludge composition and any impacts of contaminants on the project sites.

CONTACT: Municipality of Metroplitan Seattle
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Seattle, Washington 98104
(206)447-4825

This case study examines the efforts of two municipalities, Philadelphia, Pennsylvania and Wilmington, Delaware, to develop sludge application programs for the reclamation of land on the banks of the Chesapeake and Delaware Canal (C & D Canal), in Delaware. Philadelphia's attempt to secure access to the canal site failed. Wilmington utilized the site for one year, but then discontinued the project.

Wilmington Case

I. Background

The Wilmington project employed sludge generated by a secondary treatment facility which services Newcastle County, Delaware, in which Wilmington is situated. Advanced treatment was introduced between 1975-1976. The sludge was anaerobically digested and air dried. It contained 50% solids and high concentrations of chromium and copper, due to the presence in Wilmington of an electroplating industry. Cadmium content ranged from a low of 9.2 mg/kg to a high of 49.4 mg/kg in 1974. In 1979, cadmium content average below 10 mg/kg. (Source: Delaware Solid Waste Authority).

Sludge was transported twenty miles to the application site by a private trucking company. Sludge was not stored on the site, but was applied immediately upon delivery.

The application site, located near the Town of Summit, Delaware, is owned by the U.S. Government and managed by the U.S. Army Corps of Engineers. The application site consisted of spoil piles onto which iron sulfide containing minerals had been deposited during the most recent widening of the canal. The site was barren of vegetation and produced sand storms in windy weather. The site is within the same treatment plant service district as Wilmington. The site is abutted by other U.S. Army Corps of Engineers property and by agricultural lands. Land use on the site is limited to recreational purposes. The project site was leased by the Army Corps to the Delaware Solid Waste Authority, an independent state agency, for the use of Wilmington.

The project was conceived in 1973 as a joint demonstration project by the Delaware Department of Natural Resources and Environmental Control and the Army Corps of Engineers. The sludge was applied to a 17 acre site in 1975 at the rate of 50 tons per acre. The site was monitored jointly by the Army Corps of Engineers and the Department of Natural Resources and Environmental Control during 1975-1976.

In 1977 the project was expanded to 30 acres and the application rate was increased to 200 tons per acre.

Since 1977 there has been no additional sludge application, apparently because it has been less expensive for Wilmington to dispose of its sludge in a landfill. It is possible that Wilmington may resume the land reclamation project when the landfill site is depleted or costs of landfilling increase.

The entire cost of the project, except for the technical and scientific

monitoring conducted by the Army Corps of Engineers and the Department of Natural Resources and Environmental Control, was borne by the City of Wilmington. The Army Corps of Engineers provided the lease of the site free of charge.

II. Litigation - None

III. Legislation - None

IV. Regulation

There was no formal permitting process. The Department of Natural Resources and Environmental Control and the Army Corps of Engineers evaluated the application site and recommended sludge application rates and conditions, which were incorporated as terms of the Army's lease of the site to the Solid Waste Authority.

V. Political/Local Government/Public Participation and Public Relations

Local government officials were advised of the project, but no objections were raised to it. There was no concerted public relations campaign. An official at the Solid Waste Authority expressed the opinion that if the public had been informed of the project, public opposition might have obstructed it.

Objections to the project were voiced by several residents of Chesapeake City, a town in Maryland 1/2 mile from the site. Their concern focused on the effect of sludge application on groundwater quality and on the canal's aquatic life. Residents were accompanied to the site by Army Corps of Engineers technical personnel, who explained that the risks to groundwater and marine life were minimal.

VI. Technical Issues

The engineering and scientific staff of the Army Corps of Engineers and the Department of Natural Resources and Environmental Control disagreed about the proper rates of application during the planning of the test site project. Agreement was reached to initially apply the sludge at relatively low rates (50 tons/acre). After monitoring of the test site was completed, the application rate was increased to 200 tons/acre.

Philadelphia's Attempt to Use the C & D Canal

I. Background

In 1975, the City of Philadelphia became interested in the possibility of using the C & D Canal for its own sludge management program. At that time Philadelphia was planning to upgrade its Northeast treatment facility, and as a first step in the construction of the new facilities, sludge stored in lagoons at the Northeast site needed to be removed. Sludge from the Northeast lagoons contained 21-38% solids and 72-205 mg/kg of cadmium.

In June, 1975, the Philadelphia Water Department requested "concept proposals" from private contractors for removal of the sludge. After

evaluation of the proposals by EPA Region III, firm bids were accepted. The lowest bidder, a subsidiary of Browning-Ferris Industries (BFI), was granted the contract contingent upon its ability to obtain the requisite permits and to conduct a public hearing at the application site. Funding was to be shared by EPA under the construction grants program and the City of Philadelphia.

II. Litigation - None

III. Legislation - None

IV. Regulation/Political/Local Government

Application was made to the Army Corps of Engineers for use of federal land in the project, and to construct a dock on the canal and unloading area. The Corps considered BFI's application but took no final action on it. Corps officials may have been reluctant to issue a permit to a private contractor to use federal lands. An application was also made to the Delaware Department of Natural Resources and Environmental Control for a permit to transport the sludge, and to use the site. The Department declined to issue a permit on the grounds that the Canal site should be reserved for the use of Wilmington's sludge management program.

V. Public Relations

During the permitting process, BFI contracted local politicians, civic leaders, journalists, the County Agent and Extension Service Personnel in an effort to win support for the project.

CONTACT: Delaware Solid Waste Authority
P.O. Box 981
Dover, Delaware 19901

THE PHILADEPHIA CASE STUDY

I. GENERAL

A. Background

In 1975, Region III EPA, acting under the Marine Protection Research and Sanctuaries Act of 1972, required the City of Philadelphia to curtail its practice of ocean-dumping of sludge. Philadelphia reacted to the EPA action by developing a ten-point "Sludge Master Plan" containing possible alternatives to ocean dumping including the application of sludge to strip mine areas. The EPA was dissatisfied, however, with Philadelphia's subsequent progress in developing alternatives to ocean dumping, and brought legal action against the city. The litigation was resolved by an agreement among the parties to enter into a consent decree which required Philadelphia to end its ocean dumping of sludge by December 31, 1980.

This case study examines Philadelphia's attempt to develop a program of sludge application to strip mine sites in five Pennsylvania counties: Franklin, Clearfield, Somerset, Clarion and Westmoreland, and one site in Ohio. In addition, the case study examined attempts to apply Philadelphia sludge to agricultural land in Bucks County.

B. Treatment Facilities

Philadelphia operates three wastewater treatment facilities through its Water Department. The Southwest and Northwest plants are secondary treatment plants; the Southeast plant is equipped only for primary treatment. Sludge produced by the treatment facilities is anaerobically digested and de-watered by centrifuge. A portion of the sludge cake is composted by the Beltsville forced aeration method using wood chips as a bulking agent.

The final product used for mine reclamation, called "Mine Mix", is a combination of one part composted material to one part de-watered sludge cake. Mine Mix contains 50% solids, 4.5 ml/kg cadmium (7 mg/kg dry weight) and less than one part per million PCB's. Nitrogen content is 1%. (Source: Philadelphia Water Department)

C. Land Use Restrictions

a) Mine sites: Pursuant to the Pennsylvania Department of Environmental Resources (DER) "Interim Guidelines for Sewage Sludge Use for Land Reclamation" crops grown during the first year after application of sludge can not be used for either animal or human consumption. Disposal of such crops must be approved by the DER. Soil pH must be maintained at 6.5 for two years after final sludge application. A complete soil analysis is required after final sludge application before the reclaimed land is used for farming purposes.

b) Agricultural use: Pursuant to the DER's "Interim Guidelines for Sewage Use on Agricultural Lands", sludge is not to be applied to land where root vegetables eaten uncooked are grown. Dairy cattle must not be allowed to graze on sludge amended land for at least two months after a sludge application.

c) Enforcement: The DER's only means of enforcing its guidelines is to revoke the permit of the sludge hauler or mine operator for non-compliance with the terms of the permit.

D. Legislative Action

In the 1980 session, the Pennsylvania Legislature enacted an amendment to the Solid Waste Management Act which eliminates the requirement of county commissioner approval prior to issuance by the DER of a permit for sludge application to a mine site. The legislation is designed to facilitate the land application of sludge. The amendment also establishes a bonding requirement for municipalities which apply sludge to mine sites and requires DER to issue guidelines for the classification of sludge as a solid waste.

II. FRANKLIN COUNTY

A. Background

In 1973, the Region III EPA Office of Research and Development considered certain federally-owned properties in rural areas of Pennsylvania for use in a demonstration project using Philadelphia's sludge. Early in 1974, the Department of Defense approved EPA's request for use of 650 acres of land at Letterkenney Army Depot near Chambersburg, PA in Franklin County.

B. Handling; Application Site, Schedule, Finance

The EPA proposal contemplated transporting sludge by rail car approximately 150 miles from Philadelphia to Letterkenney Army Depot. The Letterkenney Army Depot comprises several thousand acres of land in Franklin County. Farm and forest lands abut the Depot. The 650 acres of land designated for the demonstration site were completely contained within the Depot; the demonstration site did not abut any private property.

Sludge application rates varying from 10-25 dry tons per acre were recommended by a research team from the U.S. Department of Agriculture. An EPA grant was to have funded the project.

C. Regulations

The DER played no role in planning or regulating this project. Whether the DER would have played a regulatory role had the project proceeded is unclear.

D. Public Relations/Politics/Public Participation

There was no public relations or public participation component of the project during the planning stage. Region III EPA officials were waiting for approval of EPA funding for the project before implementing a plan to create a citizens advisory group which would act as a liaison with the Chambersburg community. However, EPA plans were disrupted when, in February 1975, a Chambersburg newspaper ran an article about the planned project.

The newspaper article was the first opportunity local officials and residents had to learn about the project's existence. Numerous letters from local citizens were published in the Chambersburg newspaper during the weeks after the newsleak, most of which expressed reservations about the project. Additional articles about the project appeared in the local newspaper during the weeks thereafter.

On March 7, 1975, several community leaders received invitations from the EPA to attend a briefing on the proposed project.

Public opposition to the project became increasingly vocal during March, 1975. The Chambersburg newspaper conducted a poll of local residents which purported to show that a majority of citizens opposed the project. Petitions against the project were circulated and submitted to the EPA. Citizen concern focused on the effect of sludge application on groundwater, on odors, and on resentment at being used as Philadelphia's "guinea pig."

On March 27, 1975, following a very volatile public meeting, Region III EPA officials decided to drop the Letterkenney project.

III. CLEARFIELD COUNTY

A. Background/Handling/Application Site/Schedule/Financing

This project, conceived in 1975, involved the use of sludge stored in lagoons at the Southwest treatment plant to reclaim 1,000 acres of privately owned strip mines on a site approximately 150 miles from Philadelphia.

The sludge was to be transported by rail to the site, where it would be stored temporarily in a containment area. Abutting sites consisted of other strip mines and forests. Financing was to be borne by the City of Philadelphia.

B. Regulation/Political/Local Government/Interest Groups/Public Relations

At the time this project was undertaken, DER had not yet issued its guidelines for sludge application for reclamation purposes. The County Commissioners were initially favorable towards the project, but as public opposition to the project became apparent, County officials assumed a low profile and permitted

opposition forces to operate unopposed. The County Soil Conservation District was initially wary of the project, but came to support it after discussions with Philadelphia Water Department personnel concerning technical issues.

A public relations campaign was conducted by Gaess Environmental Company, the private firm which had successfully bid for the contract to handle the sludge application program for Philadelphia.

As part of the public relations campaign, the county commissioners and town supervisors were included in the planning of the project. Public meetings were held to explain the project and to answer the questions and objections of local residents. Press releases describing the project were disseminated to the local media. Project planners were interviewed on local radio. Question and answer sheets were distributed to post offices. A telephone "hot line" to field questions of local residents was established and advertised on radio.

Three housewives constituted the core opposition group. They collected money at public meetings to hire a lawyer, who organized the opposition effort. The concerned citizens group canvassed local residents and mobilized opposition forces.

Eventually the DER declined to grant the sludge application permit and the project was abandoned.

IV. MAHONING COUNTY, OHIO

The two lowest bids received in response to Philadelphia's 1975 request for bids for the removal and environmentally acceptable disposal of sludge from the Northeast treatment plant were submitted by a subsidiary of Browning Ferris Industries, Inc. The lowest bid was for the proposed transport of the sludge to the C&D canal site which has been discussed in the previous case study. The second lowest bid called for the transport of sludge by rail to Mahoning County, Ohio. The proposed application site was a privately owned strip mine which had previously been used as a disposal site for 60,000 cubic yards of digested sludge from Cleveland, and various toxic wastes.

Local citizens were very much disturbed about the past disposal practices at the site and as a result mobilized against the project as soon as it was proposed. Following a hostile public meeting, the Ohio State EPA, although agreeing that the proposal was technically sound, bowed to public opinion and denied the permit application.

V. BUCKS COUNTY

A. Background/Handling/Application Site/Schedule/Financing

The Bucks County project, conceived in 1976, was an attempt to apply sludge to agricultural land. Liquid sludge was transported by a private truck company

approximately 20 miles from Philadelphia to Westminster Township in Bucks County. The application site was a privately owned farm abutted by other agricultural land and forest. The farmer was to receive the sludge free of charge and the entire cost of the program was to be borne by the City of Philadelphia. A private company, Bi-Products Systems, Inc. had successfully bid to handle the program for Philadelphia.

B. Litigation

Litigation resulting in an injunction halted the sludge application program. Suit was filed against the individual landowner, the State of Pennsylvania and the City of Philadelphia in November 1977 by a group of local residents who alleged that the project threatened surface water and groundwater quality and that the DER lacked authority to enforce its own regulations concerning sludge application. After the suit was filed, the County Commissioners and Town Supervisors joined with the citizens group against the program. The case was heard before the State Environmental Hearing Board, an administrative tribunal which has state-wide original jurisdiction to hear cases involving actions by the DER.

The Board issued a temporary restraining order enjoining further sludge application at the site. On appeal, the Board reversed its earlier decision and 200,000 gallons of liquid digested sludge (4-5% solids) was applied at the site in October 1980. The Citizens group now plans to appeal the Board's action in the state's courts.

C. Regulation/Land Use Restriction

The DER's interim guidelines for sewage waste use on agricultural lands prohibit grazing on lands to which sludge has been applied for at least two months after the application,

D. Political/Local Government/Interest Groups/Public Relations

The county and town elected officials in Bucks County played no official role in the project's implementation. They did nothing to obstruct the project until local opposition to the project became vocal. Only after legal action to enjoin the project was brought by private citizens did the County Commissioners and Town Supervisors intervene in the action against the project.

There was no extensive public relations campaign undertaken either by Philadelphia or its subcontractor, Bi-Products Systems, Inc. There were two public meetings conducted by Bi-Products, at which technical personnel attempted to answer the objections to the project raised by local residents.

V. SOMERSET COUNTY

A. Background/Handling/Application Site/Schedule

Somerset County in western Pennsylvania contains Philadelphia's most active and largest strip mine sludge application sites. This project was conceived early

in 1978, and sludge was applied to a ten acre demonstration site later that year. In 1979, permits issued for reclamation of 250-300 acres of strip mine sites. During 1980, Water Department officials anticipate that 700-1000 acres of strip mines will be permitted and reclaimed.

The sludge (Mine Mix) is transported the approximately 200 miles from Philadephia by a Somerset County-based trucking company which makes coal deliveries to the Philadelphia area. On their return trips, the coal trucks carry the sludge to the application sites.

Sludge is usually applied to the site whithin 48 hours of delivery. County officials negotiated an understanding with the DER and Modern Earth-lines Company (Philadelphia's subcontractor, which handles the Somerset County project) that, under usual practice, no more than 300 tons of sludge would be stored at any time, and that storage time would not exceed 72 hours. However, there have been instances when the DER has permitted on-site storage for up to a month, pending preparation of the site or pending DER study of the site. In such cases, the sludge is covered with plastic sheeting.

To date, the reclamation of twelve strip-mined sites in Somerset County using "Mine Mix" have been completed. The sites which were active bituminous strip mine operations requiring backfilling to the approximate original contour and replacement of topsoil. In some cases the mine operator owned the site, but in other cases the operator only owned the mineral rights. At the inactive strip mine site which had been reclaimed under the program, there has been no topsoil replacement. Other strip mines, forests, pasture, and crop lands abut the application sites.

B. Financing

The City of Philadlephia has borne the entire cost of the sludge application program. Mine operators have received the sludge, including application, free of charge.

C. Regulatory/Legislative/Land Use Restrictions

The DER permitting process and requirements covering the use of sludge for land reclamation are in force for this project. The Somerset County Commissioners resolved this year to require that a notice be attached to the tax records of properties on which sludge has been applied. This notice is designed to alert future property buyers to the fact that sludge has been applied to the site. The notice directs the reader to the records concerning sludge applications maintained by the County Soil conservation Department and the DER.

D. Political/Local Government/Public Relations

When this project was developed DER regulations required the consent of the County Commissioners of Somerset County before Philadelphia's permit application would be considered.

After locating a mine operator who was willing to use sludge for reclamation of a strip mine site, representatives of the Modern Earthline Company, Philadelphia's subcontractor, met with the Somerset County Commissioners to explain the project. The initial application permit was for a ten acre demonstration site. The initial attitudes of the Commissioners have been described by various sources as receptive, wary and hostile. Public relations personnel took the Commissioners to visit the DER experimental sludge applications site in Venango County. The Commissioners then consented to a 10-acre demonstration site in Somerset County.

After the cooperation of the County Commissioners was won, representatives of Modern Earthline Company requested the assistance of the Commissioners in presenting and explaining the project to the general public. A public meeting was announded in the local media, at which the project was explained to the interested public by representatives of Modern Earthline Company, DER and scientists from Pennsylvania State University.

The public raised questions concerning technical aspects of the project, including the affect of the application of sludge on groundwater, the issues of odors and heavy metal content of the sludge. These questions were answered in detail by technical staff of Modern Earthline Company and by scientists from the DER and the Pennsylvania State University.

When the second permit was submitted to DER in 1979, another public meeting was held. Apparently because the scale of the project was to be greatly expanded under the new application, public apprehension and concern was more pronounced at this second meeting than at the first. Public discussion of the project led to the creation of a citizens advisory committee which was comprised of representatives of the County Soil Conservation Department, the Agricultural Extension Service, local farmers and mine operators. The advisory committee was charged with the task of overseeing the project on behalf of the general public. The committee met monthly and received the results of the site monitoring and testing conducted by scientists from Pennsylvania State, the Soil Conservation Department, and Modern Earthline Company.

In addition to the public meetings, Modern Earthline Company conducted a public relations campaign which included slide and film presentations to local associations (e.g., Kiwanis, Rotary and Lions Clubs), circulation of brochures explaining the project, education programs in the schools, sponsoring of visits by private citizens to the demonstration site and establishment of rapport with the local media.

Modern Earthline Company has stressed in its communication with the Somerset County community that the sludge application program would bring economic benefits to the people of the county. Modern Earthline Company subcontracted with a local trucking company, which hires local dirvers, to transport the sludge. They also hired local workers to apply the sludge, and purchased limes and equipment from county-based merchants. Modern Earthline Company's management and scientific staff are housed at local motels when they are working at sites in Somerset County.

VI. WESTMORELAND, CLARION COUNTIES

In 1979, Modern Earthline Company obtained permits to reclaim 10 acres of strip mines in Westmoreland and Clarion Counties. The project planning and implementation paralled that of Somerset County.

CONTACTS: Philadelphia Water Department
1140 Municipal Services Building
Philadelphia, Pennsylvania 19107
(215)686-3864

Pennsylvania Department of Environmental Resources
Bureau of Solid Waste
3rd and Locust Street
Harrisburg, Pennsylvania 17120
(717)787-7383

Modern Earthline Company
1015 Chestnut Street
Philadelphia, Pennsylvania 19107
(215)922-4750

County Commissioner
Somerset County
P.O. Box 30
Somerset, Pennsylvania 15501

Institute for Research on Land and Water Resources
Pennsylvania State University
University Park, Pennsylvania 16802
(814)863-0291

GRUNDY COUNTY, ILLINOIS

I. Background

Soil Enrichment Materials Corporation (SEMCO), a small independent company organized by W. J. Bauer of Chicago, was awarded a 2.5 million dollar contract by the Metropolitan Sanitary District of Greater Chicago (MSDGC) to transport and land apply 450,000 wet tons of 10-year-old sludge located in lagoons at the Calumet Sewage Treatment Plant--part of the Metropolitan Sanitary District of Greater Chicago. SEMCO was also awarded other similar contracts by MSDGC and other agencies. The Calumet facility provides secondary wastewater treatment, but no sludge processing. The sludge in the lagoons had 12% total solids.

In May 1971, SEMCO began transporting the sludge by train to Grundy County, 70 miles away. At the site, the sludge was stored in a small lagoon which had the capacity for 6 train loads of sludge. The sludge was then sprayed on the land.

The site consisted of land leased from several farmers at $125/acre/year. Surrounding the site were other corn and soybean farms.

Work was stopped in July 1971, less than two months after the start of the project and with 1/3 of the work completed.

II. Litigation

In July 1971, the Circuit Court of Grundy County issued an injunction halting all operations at the site. The County of Grundy alleged that the SEMCO operations required a variance in the zoning of the land. The land on which the storage lagoon was located was zoned "heavy industrial" and the land application site was zoned "agricultural." The County contended that SEMCO's operations were not of an agricultural nature, but involved "waste disposal," which was not permissible without a County waste disposal permit. The ruling was in favor of the County and SEMCO was forced to relocate to Arcola, Illinois where SEMCO had been conducting a landspreading project utilizing sludge from MSDGC's West-Southwest facility for 9 months previous to the Grundy County project. However, Arcola is approximately 150 miles from the Calumet facility. The new transportation and construction costs caused SEMCO to incur large financial losses. SEMCO appealed the case to the Appellate Court, Third District in Ottawa, Illinois in February 1973. SEMCO won the appeal, but was unable to recover its initial losses.

III. Legislation

There was no legislative action taken as a result of this case.

IV. Regulation

The Illinois Environmental Protection Agency (IEPA) was the key regulatory agency in the case. SEMCO did eventually secure the necessary waste hauling permit from IEPA. As part of the permit, the IEPA required that periodic soil and crop analyses be conducted. SEMCO felt that IEPA required many more monitoring tests than were technically necessary and were wasting time and

money. However, a considerable amount of laboratory information on soils, crops, water, and sludge was obtained.

V. Political

William Bauer, then president of Bauer Engineering, Inc., began promoting land application projects in 1969. The University of Illinois was involved with a research project at the Arcola site, but there were no research projects planned for the Grundy County site.

Those opposing the Grundy County project were individual abutters and a few other county residents. One reason for their opposition may have been that Grundy County which is predominantly Republican, felt that Cook County, which is Democratic, was "out to get them." Also, the most cooperative farmer leasing land to SEMCO, was a prominent Democrat in the county.

VI. Local Government

There was no initial local government policy toward the project.

VII. Interest Groups

There were no organized interest groups; however, the individual abutters were involved in writing letters to the editor of the local paper and in pressuring the county attorney to file suit. The abutters were upset about the project from the beginning, and utilized the zoning by-laws as a means to halt the project. SEMCO maintains there were many odor complaints even when only water was sprayed on the site, and felt that the citizens filed suit based on the zoning violation in order to establish a better legal standing than would have been possible with a suit based on odor nuisance.

VIII. Public Participation and Public Relations

William Bauer organized a public relations program when the abutters began to complain. The PR program involved his going door-to-door to speak with the neighbors, tours of the site, articles in the local paper, and public meeting participation. Because the landspreading concept was new, SEMCO was unable to foresee the problems with the public.

IX. Technical Issues

Heavy metals were not an issue in Grundy County, although high mercury levels were reported by SEMCO's lab subcontractor on one occasion. After retesting it was realized that a decimal point error had been made. However, citizens in a community in Maryland where SEMCO was planning another project, got hold of the information concerning the high mercury levels. SEMCO found it difficult to make people believe an arithmetic error had been made.

Procedural aspects of the project were not an issue and the question of the benefits of the land application of sludge were never raised. However, an accident did occur when a bus load of children was sprayed with some sludge. Needless to say, this resulted in numerous complaints to the County Health Department from concerned parents. Again, this incident was brought up by the citizens involved in the Maryland project. If the Grundy project had continued, SEMCO would have changed the application technique to disking, a technique it developed in Arcola in 1972.

CONTACT: W.J. Bauer Consulting Engineers
20 N. Wacker Drive
Chicago, Illinois
(312)372-6436

WEST VIRGINIA AND MARYLAND

Background

The USDA Plant Science Division, West Virginia University, Morgantown, is presently researching the use of sewage sludge in strip mine reclamation in West Virginia and Maryland. The treatment plants are located in Morgantown, West Virginia; Frostberg, Maryland; and Westernport, Maryland. All plants use activated sludge treatment with vacuum filters. The sludge's chemical characteristics are in the following ranges: 0.1-0.3 ppm cadmium, 500-1000 ppm Pb, and 10-15% total solids.

The reclamation sites are located in Fort Martin, Morgantown, Elkin, and Kingwood, West Virginia and near Franconia in Maryland. All plant-to-site distances are 10 miles or less. Sludge is transported to the sites by dump trucks which are operated by either the USDA or the local authorities. There are no storage facilities at the sites. According to the Project Supervisor, the total area involves in the project is approximately 5 acres.

The project began at the Fort Martin site in 1970. The EPA has funded most of the research via pass-through funds and there has been no local input in the project other than in hauling the sludge. The USDA cooperates with the Department of Natural Resources in both states in providing test data and with the County Health Departments by obtaining the necessary permits. Bennett feels that the additional monitoring requirements imposed by the Health Departments over the years have enhanced the research project in that the regulations have helped to accelerate some of the information gathering aspects of the USDA's research.

Local and state publications and national journals have included articles on the USDA research. USDA officials have also been responsive to any public requests for lectures, tours, and written information, although there is no organized public relations program. The public's attitude has been favorable toward the project although a few people were initially opposed. The strip mine operators were initially hostile because they felt that the USDA was stepping in to condemn the mines for their environmental damage. However, Bennett claims that over time the miner operators have changed their views and are now supportive and willing to help with public relations.

CONTACT: USDA - Plant Science Division
West Virginia University
Morgantown, West Virginia 26506
(306)599-7186

LOUISA COUNTY CASE STUDY

I. Background

This case study concerns the reclamation of three abandoned mining sites along Contrary Creek, in Louisa County, Virginia. Acid mine drainage from the three sites had lowered the pH of Contrary Creek to 2.5 and threatened the water quality of Lake Anna, into which Contrary Creek empties. The Virginia State Water Control Board obtained EPA funding for a demonstration project to reclaim the mine sites.

The project used sludge generated by the Blue Plains Treatment Plant in Washington, D.C. The Blue Plains Treatment Plant, which services several suburban communities as well as the District of Columbia, is a secondary treatment facility. The sludge is anaerobically digested and concentrated by vacuum filtration to 20% solids. Cadmium content averages 17 ppm.

The sludge was hauled in 18 ton capacity trucks, the cost of which was borne by the City of Washington, D.C. The application sites were approximately 100 miles from the Blue Plains facility. Sludge was not generally stockpiled on the sites, the usual practice was to apply sludge immediately upon delivery.

The three sites, which were not within the Blue Plains Treatment Plant service district, were each privately owned. The Sulfur mine site is owned by a paper manufacturing company, and the Boyd Smith and Arminius sites are owned by mining companies. Each of the sites is abutted by forest areas.

There are land use restrictions on the Sulfur and Boyd Smith mine sites which require the landowners not to use the sites for any purpose that would reverse the reclamation measures. This use restriction was imposed as a requirement of the EPA grant which funded the project, in the form of easements obtained from the landowners by the Commonwealth of Virginia.

The project was conceived in 1973 when the Virginia State Water Control Board (SWCB) applied to the EPA for a demonstration grant under section 107 of PL 92-500. The grant was awarded in 1975. Construction related to the land application project was performed in April 1976. Sludge was applied to the Sulfur and Boyd Smith sites in the spring of 1976, and to the Arminius site in the fall of 1976. The project was limited to the areas reclaimed in 1976, which constituted approximately 25 acres.

Financing for the Sulfur and Boyd Smith sites was provided by an EPA grant under section 107 of PL 92-500, which provides funds for mine water pollution control demonstration projects. The federal government paid 60% of the project's costs, with the remaining 40% borne by SWCB in the form of inland services such as project management and monitoring. Sludge and transportation costs were borne by Washington, D.C.

The costs of the Arminius site was borne by the site's owner.

II. Litigation

The company which owned the Arminius site was required by the SWCB to enter into a consent agreement in which it committed itself to a project schedule. The owner was required by Virginia law to abate the acid seepage from the site and informally committed itself to do so in conjunction with the SWCB project. However, the company failed to keep its informal commitment, and the SWCB moved to bind the company by a consent order. The Arminius site was reclaimed in the fall of 1976.

III. Legislation - None

IV. Regulation

The project was monitored by the SWCB, but there was no permitting process involved. Land use restrictions required as a condition of the EPA grant, were imposed in the form of easements obtained from the landowners. The Soil Conservation Service provided engineering and construction inspection services. The Virginia Department of Health's regulations regarding disposal of wastewater sludge were complied with. Sludge hauling was performed in compliance with Virginia Department of Highways and Transportation regulations, and trucks were rented to minimize travel through populated areas.

V. Political/Local Government

The public utility company which uses the waters from Lake Anna to cool its nuclear power plant played a role in alerting the SWCB in 1973 to the danger posed to Lake Anna's water quality by the acid drainage from Contrary Creek.

The county government was aware of the project, but played no role in either advancing or opposing it.

VI. Public Participation

The SWCB conducted a public relations campaign to explain the project to the Louisa County community. Press releases were distributed to the local media and a public meeting was held to explain the project to local elected officials and civic leaders. There was no discernable opposition to the project.

CONTACT: State Water Control Board
Valley Regional Office
116 North Main Street
P.O. Box 268
Bridgewater, Virginia 22812

PITTSBURGH CASE STUDY

I. Background

In February 1980 a plan was conceived to use waste activated sludge from the Allegheny County Sanitation Authority's Northside Plant for agricultural use on the Vic-Nor Sod Farms in Butler County, PA, approximately 30 miles away. The Northside Plant is an activated sludge plant serving the City of Pittsburgh and 76 surrounding municipalities. The application site in Butler County is surrounded by sod fields and forests. Construction for the project began in April 1980.

The sludge (7% solids, lime stabilized pH 11-12, 42 ppm Cd, 2200 ppm Zn, 540 ppm Cu, 718 ppm Cr, 420 ppm Pb) is to be transported to Butler County by 6,500 gallon tank trucks. Storage facilities in Butler County consist of another 6,500 gallon tank. The sludge is given to the farmer free with land use restrictions imposed by the Pennsylvania Department of Environmental Resources. These restrictions include:

- All sludge is to be digested or chemically stabilized.
- Sludge is not to be applied to root vegetables or vegetables that are not cooked.
- Dairy cattle must not be allowed to graze on land for at least two months after sludge application.

II. Litigation - None

III. Legislation - None

IV. Regulation

Regulatory aspects of the project center around obtaining permits and meeting pre-existing minimum standards. Regulatory agencies involved include:

- EPA
- State Health Department
- State Department of Environmental Resources (very supportive)

The local land use and environmental agencies in Butler County were notified but they had no input into the project design.

V. Political - None

VI. Local Government - None

VII. Interest Groups - None

VIII. Public Participation and Public Relation - None

IX. Technical Issues - None

CONTACT: Allegheny County Board of Health
Water Pollution Program
Frank B. Black Health Center
Bldg. #5
40th and Pennsylvania Avenues
Pittsburgh, Pennsylvania 15224
(412)578-8040

HARLEM VALLEY, NEW YORK

I. Background

Harlem Valley is the name given to the region surrounding the New York and Harlem Railroad tracks in Eastern Dutchess and Columbia Counties in New York State. The area thrives on dairy farming, but it is necessary to import feed, fertilizer, machinery, and building materials by rail. The Harlem rail line has been financially ailing over the last few years and the local farmers are worried that it might go out of business. In 1975, town officials from Dutchess and Columbia Counties authorized the formation of a task force to study the possibility of transporting sludge from the New York metropolitan area for composting and spreading on land. This idea was based on the fact that government subsidies might be obtained for the $15 million project under Section 201 of the Water Pollution Control Act. The composted sludge would be used on productive farmland, quarried land, and marginal unproductive farmland. According to the Harlem Valley Transportation Association, an "energy plantation" was planned for the reclaimed wasteland.

Initial local reactions to the plan were negative and town officials worried about the potential "politically damaging stigma" attached to the project. A tour was made of the USDA Research Center in Beltsville, Maryland where Washington, D.C. sludge is being composed. Twenty residents made the trip and were impressed with that project. As a result, the association set out on a campaign to tackle the local acceptance problem. Through lectures and slide shows at community group meetings, the proposal gained a great deal of support. However, the local town boards had reservations about allowing an outside municipality to operate a project within their jurisdictions. New York City authorities also expressed reluctance about such an arrangement, especially when the Town of Ancram proposed that it have control over the project. This idea, however, was deemed illegal since under New York State Town Law, no town can operate a business or give anything away. As of July 1978, the association was pushing for legislation to authorize the formation of a regional agency to control the project. Since that time there has been little action on the proposal.

The towns would be aided by the Environmental Facilities Corporation (EFC), a state agency which helps municipalities set up public interest projects. EFC would assist in the selection of consultants, make sure local needs are met, and represent local interests in design meetings with other municipalities.

A major stumbling block for the project resulted from New York City's sludge disposal feasibility study in September 1978. The City has been under tremendous pressure to find an alternative to its existing practice of ocean dumping sludge by the end of 1981. Consequently, the amount of time necessary

to implement each alternative held top priority as an evaluation criterion. The assessment of projects such as the Harlem Valley proposal was summarized in the "Draft Environmental Assessment Statement" as follows:

> "The options to: (1) ship sludge, in any process state, overseas to arid countries for possible land treatment to increase agricultural production; (2) transport sludge to rural areas in New York or other adjacent states for land application; and (3) transport sludge to strip mines in any state for landfilling were faced with legal and institutional constraints not previously breached by any public agency within a clearly defined timeframe. Therefore, the risks involved rendered recommending such untried schemes in a critical time period totally unacceptable."

According to the State Department of Environmental Conservation (DEC), the Harlem Valley project has been in the proposal stage for the past two years. A formal proposal to DEC which is required for such a project, has never been submitted. As of February 1980 there was still talk of the project, but the project's initiator has since moved from the area and therefore the project's present and future status is unclear.

CONTACT: Department of Environmental Conservation
50 Wolf Road
Albany, New York
(518)457-6605

MONTGOMERY COUNTY AND PRINCE GEORGE'S COUNTY, MARYLAND

I. Background

The Blue Plains Wastewater Treatment facility, located in the District of Columbia, services the City of Washington and parts of suburban Montgomery and Prince George's Counties in Maryland and Laudon and Fairfax Counties in Virginia. The facility is owned and operated by the District of Columbia. Prince George's and Montgomery Counties pay users charges for use of the plant through the Washington Suburban Sanitary Commission (WSSC), a public utility managed jointly by both counties. Each of the system contributors is required by law to manage a proportional amount of the sludge produced at the facility. This case study deals with the WSSC's attempts to meet this responsibility.

Most of the influent undergoes advanced secondary treatment. Approximately 80% of the sludge produced by this process is undigested; the other 20% is anaerobically digested. The undigested sludge is chemically stabilized to a pH of 11. Cadmium content averages 5 to 8 ppm.

Digested sludge is transported by a private trucking company under contract with the District of Columbia to farms and to publicly-owned parks and road embankments. Undigested sludge is hauled by a private company under contract with the Maryland Environmental Service, a state agency, to entrenchment sites in both counties.

There are no storage facilities at any of the entrenchment sites. When land application or entrenchment activities are halted by inclement weather, the sludge is stored at the Blue Plains facility.

Entrenchment sites are owned by the WSSC or by the individual counties, and are operated by the Maryland Environmental Service, an independent state agency which manages the entrenchment program. The entrenchment sites are abutted by low density residential areas. The sites are closed for five years to all non-waste disposal uses and then re-evaluated.

Land treated with digested sludge may not be used for the cultivation of crops and vegetables directly consumed by humans for at least one year after application to the soil. The Maryland State Department of Health issues permits for sludge application.

Entrenchment of undigested sludge began in 1974 in accordance with a court order which was issued that year. Agricultural use of digested sludge in Montgomery County dates back to the 1930's. Prior to the 1974 court order, most of the sludge was managed by the District of Columbia.

The cost of the program is borne by the WSSC, whose budget is approved by both county governments. Digested sludge is supplied to farmers free of charge. No federal or state monies are used for the entrenchment program.

II. Litigation

In 1973, the State of Virginia sued the District of Columbia and the WSSC in federal district court, alleging that the Blue Plains plant was providing inadequate treatment and exceeding the design capacity and that as a result raw and inadequately treated sewage was emptying into the Potomac River. The District of Columbia and the WSSC were ordered to expand and improve the Blue Plains plant.

The expansion and improvement of the Blue Plains plant resulted in an increase in the amount of sludge generated. The counties were unable to agree upon a fair allocation of the burden of sludge disposal and the controversy was heard in federal district court. The litigation was resolved in 1974 when the parties entered a consent agreement whereby they agreed to share the sludge generated by Blue Plains attributable to each county's influent.

Legal difficulties persisted, however, when Montgomery County sought to purchase a tract of land approximately one mile from its border with Prince George's County for use as an entrenchment site. Prince George's County objected to the choice of a site near its own community. Abutting landowners also objected to use of the tract for trenching operations on the gournds that such a use would violate restrictive covenants on the tract's deed concerning noise and odors. Montgomery County sought to proceed with the purchase anyway, and it requested that WSSC buy the site for the use of Montgomery County, as it contended WSSC was required to do under the terms of the consent decree. When WSSC refused to authorize the purchase, Montgomery County filed a motion in federal court to compel WSSC to purchase the tract. Prince George's County opposed the motion, arguing that the purchase was beyond WSSC's authority. The court held that WSSC had the authority to purchase the site and ordered the purchase.

Prince George's County appealed the decision to the U.S. Court of Appeals for a stay of the purchase. When the appeals court refused to stay the purchase, Prince George's County appealed the case to the U.S. Supreme Court, charging that the district court had exceeded its jurisdiction by hearing the case. The appeal was heard during the Court's 1980 fall session and was denied.

III. Legislation

In its 1979 session, the Maryland State legislature passed a bill which requires that applications for permits to land apply sludge be subject to a public hearing which could become an adjudicatory process on request of either side.

IV. Regulation

The State Department of Health issues permits for the land application of sludge and for entrenchment operations. Sites to be used are also subject to recommendation by the county executives and approval by county councils. Soil testing is done by the University of Maryland, Department of Agronomy. The State Department of Health and Mental Hygiene determines the rates and conditions of sludge application and entrenchment.

V. Public Participation

The county governments have held public briefings to explain the entrenchment projects to the general public. Issues discussed at the meetings include choice of sites, health and environmental impacts and technical issues. Local media have also covered the projects and the attendant controversies. Citizen groups were accompanied to the entrenchment sites by county officials and opposition groups were given the opportunity to meet with county executives.

CONTACTS: Office of Environmental Planning
Montgomery County, Maryland
(301)279-1284

Washington Suburban Sanitary Commission
312 Marshall Avenue
Laurel, Maryland 20810
(310)441-4164

Maryland Environmental Service
60 West Street
Annapolis, Maryland 21401
(310)269-3351

FORT COLLINS, COLORADO CASE STUDY

I. Background

Fort Collins is currently proposing an agricultural land application project on city owned farm land located just outside the city limits for sludge from its activated sludge secondary treatment plant. The application site is abutted by two gravel pits, a river, an interstate highway and a residential development containing fewer than 10 homes with room for expansion. The sludge from the Southwest plant contains 30 mg/g cadmium and 10-20 mg/g PCB's and is treated by anaerobic digestion and vacuum filtration. It is proposed to transport the sludge by pipeline across a river to the farm, with storage lagoons to hold sludge during inclement weather. According to the proposal the storage lagoons would be located on the part of the farm farthest from residential abutters, however, there has been some concern voiced by EPA that the proposed location is within the ten year flood plain. The city would be responsible for maintaining the pipeline and spreading the sludge and would contract out the farming operations. No formalized restrictions on land use have been proposed. However, Fort Collins officials are thinking about some operational restrictions including:

- Cumulative restrictions on cadmium loadings
- Growing only field corn to keep sludge as remote in the food chain as possible
- Sludge application plots on the site would be rotated out of production every fourth year

The project was conceived in 1978. The first sludge application is proposed for 1981. EPA would apparently help fund the 3.5 to 4.5 million dollar project with construction grants money. The City of Fort Collins has already purchased the land for $1.0 million to avoid regulatory pressures to impose land use restrictions.

II. Litigation - None

III. Legislation

The 1976 amendment to the State of Colorado Solid Wastes Facilities and Disposal Act states that where sludge is used for beneficial purposes a certificate of designation as a solid waste disposal site is not required. While the city claims that this project is one such beneficial use, the county health officials believe that a certificate is required. As of yet the project has not come to the point where this issue has been resolved.

IV. Regulation

The County Health Department which has been delegated authority by the State Department of Health appears to be the key regulatory agency. They will issue a certificate of designation if necessary. Fort Collins also has to meet EPA requirements for Construction Grants approval. The final setting of cumulative cadmium restrictions will effect the project life.

V. Political

The real political situation here is the County Health Department's insistence that the application site have a certificate of designation as a solid waste disposal facility. Because the County Health Department is no longer involved in effluent monitoring (all lab work is done at the wastewater treatment plant), they need to redefine their role. This redefinition involves their need to certify sludge application sites. Also, on different occasions Fort Collins has ignored the County Health Department and went directly to the state level Health Department.

VI. Local Government - N/A

VII. Interest Groups

The primary interest group is the residential abutters to the application site who seem to show more concern than opposition.

VIII. Public Participation and Public Relations

There has not been an organized public relations program as such. Fort Collins has a good working relationship with the media and some brainstorming ideas such as using sludge grown corn for gasohol have helped to create a positive public image.

IX. Technical Issues

There have been no technical issues raised and the abutters have not organized.

X. Monitoring

Fort Collins WWTP will be responsible for monitoring the sludge quality as well as for the performance of background monitoring at the proposed application site. Sludge will be collected from the anaerobic digestion units monthly and results indicate fairly constant sludge composition. Typical values for critical parameters include:

Cd	30 mg/g
Cu	1500 mg/g
PCB's	10-20 mg/g
pH	approximately 7
TKN	4-6%
NH_3	2/3 TKN

The ten monitoring wells located on the proposed application site will be monitored monthly with a range of analysis performed including Cd, Cu, Pb, Ni, Zn, Ar, PCB's, pH, alkalinity and N.

CONTACTS: Briscoo Maphis
2336 Pearl Street
Boulder, Colorado 80302
(303)449-8668

Fort Collins Wastewater Treatment Plant
3036 East Drake Road
Fort Collins, Colorado 80525
(303)484-4220

REDWOOD NATIONAL PARK

Background

As a result of the passing of PL 95-250 in 1978, Redwood National Park was expanded to incorporate a new area that has some paved roads. The Park authorities plan to turn the new acquisition into a forested area with horse and foot trails. The paved roads are to be torn up which will result in the creation of many areas devoid of topsoil. In 1979, Lee Perkerson, a Forest Manager with the Redwood National Park, decided that it might be beneficial to use compost on this land. Demonstration projects were conducted using the static pile technique to compost the residuals from on-site chemical toilets and other waste produced in the Park.

A full scale project is now planned in which Redwood will buy compost produced by sewage treatment plants in Arcata and Eureka, California. Starting in the summer of 1981, compost will be transported the 60-70 mile distance from these towns to the Park by truck. The forest has prepared an Environmental Assessment Statement for the U.S. EPA and has conducted the baseline studies in compliance with the California State Water Quality Board permitting process.

Perkerson does not anticipate any technical problems with the compost since the chemical toilets use a harmless formaldehyde base and there are no industries contributing to the influent at either the Eureka or Arcata plants.

Public participation has been fairly passive. The Park is cooperative in supplying information to interested visitors.

CONTACT: Redwood National Park
Redwood, California
(707)822-7611